

THE HOPE REPORTS

VOL. XIV

1904—1929

W. J. BURCHELL AND HIS BRAZILIAN
BUTTERFLIES, ETC. (1825—30)
INSECTS FROM VARIOUS ZOOL. REGIONS

CATALOGUE OF
O. PICKARD-CAMBRIDGE ARACHNOLOGICAL LIBRARY

EDITED BY

EDWARD B. POULTON, M.A., D.Sc., Oxon.,
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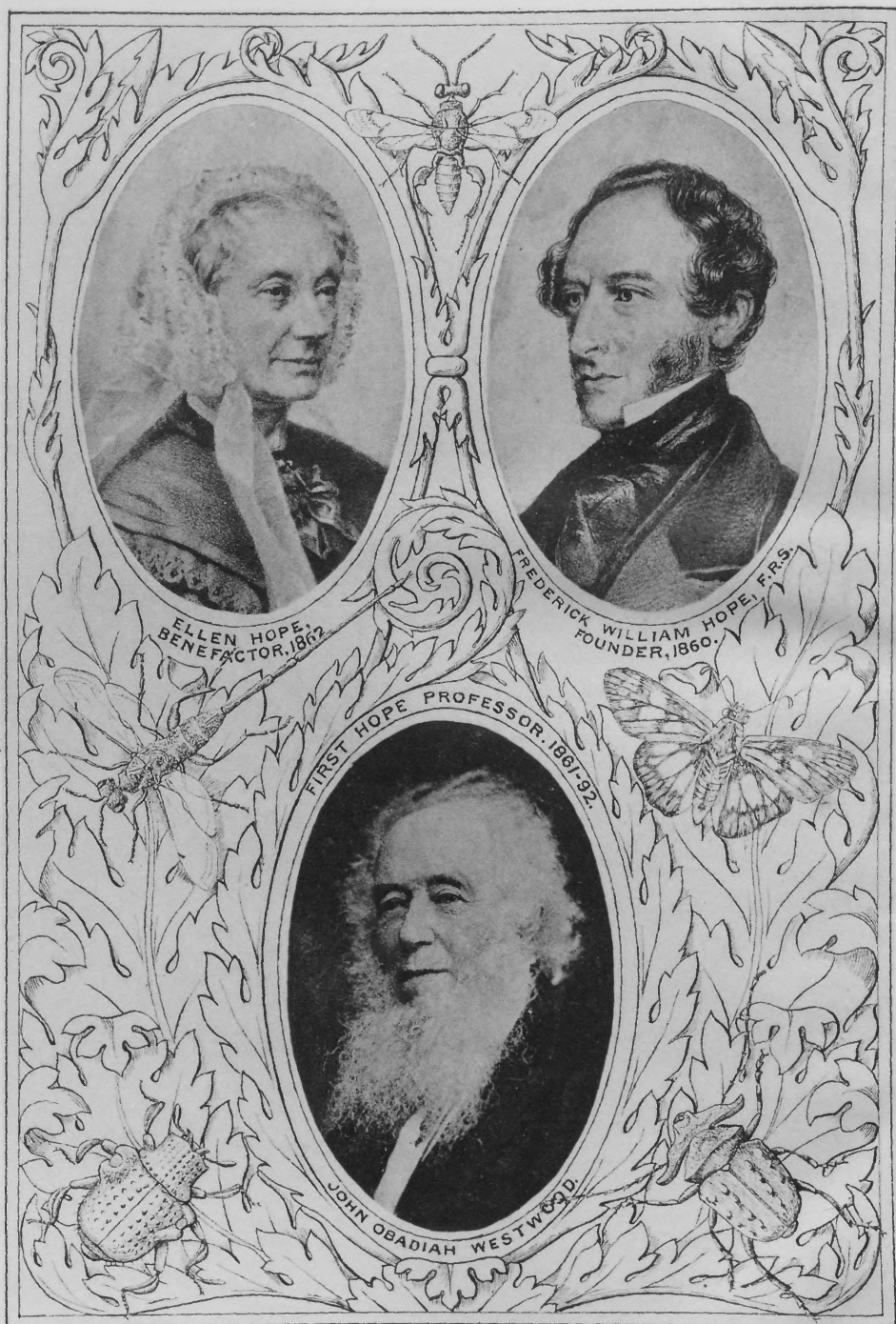
HONORARY MEMBER OF THE ACADEMY OF SCIENCE, NEW YORK

CORRESPONDING MEMBER OF THE SOCIETY OF NATURAL HISTORY, BOSTON, AND
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PREFACE

TEN years elapsed between the appearance of Volumes VIII and IX of these Reports* and the issue, in 1923, of X—XIII with the quarto Appendix to VIII. The Royal octavo Appendix to X appeared in 1924, and now, five years later, I find that materials for the five Volumes XIV—XVIII have accumulated. The last two volumes of this series are of Royal octavo size, but these, for reasons to be stated in the Preface to XVIII, are not treated as Appendices but numbered consecutively with the others, and this plan will be followed in all future issues.

In the present volume, XIV, Memoir No. 2, with Nos. 3A. and 3D., by the Professor, attempt to give some account of the life, the travels and the work of the great naturalist, William John Burchell, whose insect collections and the invaluable MS. notes upon them are among the most treasured possessions of the Hope Collection. The other sections of No. 3 are devoted to parts of the Burchell collection—3B., by Mr. R. I. Pocock, to a new stridulating organ in a Brazilian scorpion discovered in 1828; 3C., by the late Monsieur Jules Bourgeois, to the African and Brazilian Rhipidocerid and Malacoderm beetles. The remaining sections describe parts of the great collection of butterflies made on the Brazilian journey (1825-1830):—3E., F., G., H., and I., by Miss Cora B. Sanders, of Lady Margaret Hall, Oxford (Mrs. Hodson, F.L.S., of the Eugenics Education Society), describe, respectively, the Ithomiinae, Danainae, Satyrinae, Morphinae, and Brassolinae; 3J., by the late Maj. J. C. Moulton, of Kuching, Sarawak, the very numerous

* I take this opportunity to explain that the reference quoted under No. 6 of the Contents of Hope Reports, Vol. VI, is to the full account of Dr. Dixey's lecture, whereas Memoir No. 6 is a reprint of the abstract of the Report of the British Association, 1907, p. 736.

Nymphalinae; 3κ., by Mr. E. G. Joseph, the Heliconinae. This last paper is not quite complete, but the omitted pages, containing references to four species, may be consulted in the Ann. Mag. Nat. Hist., Vol. V, 1910, pp. 344-346. Mr. Joseph also dealt with the Burchell Brazilian Acraeinae butterflies (*Ibid.*, Vol. VII, 1911, p. 9), but separata of this paper are not available. The original intention was to issue the Burchell papers together in one or more volumes, and Messrs. Taylor and Francis courteously printed separata in sheets with continuous paging for this purpose. The continual receipt of fresh material and ever-increasing demands upon time, brought the attempt to a close with p. 152 of the Heliconinae, the remaining pages, together with the Acraeinae, being omitted because insufficient to make up a full sheet. I am now glad to bring together and issue this first part of the enterprise and to remember how much pleasure a first experience of such work gave to the authors of the papers on the Brazilian butterflies. I have spoken elsewhere of the inspiration it brought to Major Moulton and of how 'he never forgot this early interest and would often remind me of his plan that we should one day travel together through the heart of Eastern Brazil in the footsteps of the great naturalist.' (Hope Reports, Vol. XVII, No. 4, p. 7.)

The tropical American insect fauna also supplies the subject of the next memoir, No. 4, an important revision of the gigantic flies of the family Pantophthalmidae, by Major E. E. Austen, D.S.O., whose researches were based on a study of these Diptera in the Natural History Museum and the Hope Department.

Nos. 5 to 10 deal with insects from the Palaearctic Region, although the races of *Heodes phlaeas*, the well-known 'Small Copper' butterfly, spread beyond this area westward into the Nearctic and southward into the Ethiopian and Oriental Regions. Mr. E. B. Ford's interesting and much-needed paper describing these races is illustrated by a beautiful coloured plate most kindly prepared by Dr. Eltringham.

The next five papers are strictly Palaearctic or Polar. No. 6, by Mr. B. C. S. Warren, is a preliminary description of a new Spanish race of a Hesperid butterfly; No. 7, by the late Mr. F. C. Woodforde, a list of butterflies taken in France in 1921 and 1922, with remarks on the species; No. 8, by Commander J. J. Walker, a very interesting account of Arctic Lepidoptera collected by Sir James Ross and now preserved in the Dale Collection; No. 9, by Mr. O. W. Richards, a summary of the differences between the Mediterranean species of *Noto-gonia* (Fossorial Wasps); No. 10, by Dr. H. Eltringham, a description and figure of the extraordinary larva of *Pterocroce storeyi* (Nemopteridae), from Egyptian caves, with notes by Mr. E. N. Willmer and Mr. C. B. Williams.

The next five papers are concerned with insects from various parts of the Ethiopian Region:—No. 11, by Mr. G. T. Bethune-Baker, with new species of butterflies; No. 12, by Capt. N. D. Riley, with *Artitropa*, a genus of Hesperiidæ ('Skippers'); No. 13, by Dr. A. v. Schultess of Zürich, with wasps (Vespidae) collected by Dr. S. A. Neave; No. 14, by Dr. G. D. H. Carpenter, with Speke's Tragelaph of the Sese Islands in N.W. Victoria Nyanza, while an Appendix, by the Professor, gives a brief account of the insects collected on Nkosi, the southernmost outlying island of the group; No. 15, by Dr. R. Hanitsch, with the cockroaches (Blattidae) of Rodriguez.

Three memoirs only are devoted to the insects of the Oriental Region:—No. 16, by Dr. Hanitsch, to Dr. Mjöberg's collection of cockroaches from Sumatra; No. 17, by Capt. N. D. Riley, to the butterflies of the Mt. Everest Expedition (1921); No. 18, by the late Mr. G. C. Champion, to a revision of the Malayan and Indian beetles of the Melyrid subfamily Carphurinae.

Nos. 19-22 deal with insects from the Australian Region, and the first three with parts of the extremely interesting collections made by Dr. J. R. Baker in the New Hebrides. In No. 19 Mr. J. V. Pearman writes on

the Psocoptera; in No. 20, Dr. C. Willemse, of Eygels-hoven, Holland, on the Orthoptera; in No. 21, Mr. H. Womersley, on the primitive Apterygota. No. 22, by Dr. R. S. Bagnall and Mr. R. Kelly, is a description of a new Australian species of *Trichothrips*, a female of which appeared on a newspaper which the last-named author was reading at Hawthorn, Victoria.

An appropriate close to the first of the five volumes now issued is formed by the Catalogue of the splendid Arachnological Library which, with the unique Collection, was bequeathed to the University by the Rev. Octavius Pickard-Cambridge, M.A., F.R.S. The Library was arranged and the Catalogue compiled by the son of the testator, Mr. A. W. Pickard-Cambridge, Fellow of Balliol College and now Professor of Greek in Edinburgh University. As explained by the author in an Introductory Note, the appearance of the Catalogue fulfils a condition of the bequest. A copy of this Catalogue with the shelf-numbers inserted by the author is placed in the Library, which is kept in convenient proximity to the Collection of Arachnida.

EDWARD B. POULTON.

Hope Department of Zoology,
University Museum, Oxford.

14th October, 1929.

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- 3A—3K. THE COLLECTIONS OF WILLIAM JOHN BURCHELL, D.C.L., IN THE HOPE DEPARTMENT, OXFORD UNIVERSITY MUSEUM.
- 3A—I. Introduction, with Plate I (map of Burchell's travels in Brazil, 1825-30), by the Professor. Page 1. (Ann. Mag. Nat. Hist., Ser. 7, Vol. XIII, 1904, Pl. III, p. 45.)
- 3B—II. On a New Stridulating-Organ in Scorpions discovered by W. J. Burchell in Brazil in 1828, with Plate II, by R. I. Pocock, F.R.S., F.Z.S. Page 13. (*Ibid.*, Pl. IV, p. 56.)
- 3C—III. Rhipidocérides et Malacodermes recuillis par W. J. Burchell dans ses voyages en Afrique australe (1810—1815) et au Brésil (1825—1830), avec le description de quatre espèces nouvelles. Par J. Bourgeois. Page 19. (*Ibid.*, p. 89.)
- 3D—IV. On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825—1830. Introduction, by the Professor. Page 33. (*Ibid.*, p. 305.)
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- 3J—VI. Nymphalinae, by the late Major J. C. Moulton, O.B.E., M.A., D.Sc., Magdalen College, Oxford. Page 75. (*Ibid.*, Vol. II, 1908, p. 165; Vol. III, 1909, pp. 7, 98.)
- 3K—VII. Heliconinae, by E. G. Joseph, Lincoln College, Oxford. Pages 131—152. (*Ibid.*, Vol. V, 1910, p. 322.) The last three pages, 344—346, of the original paper are omitted.
4. A Revision of the Family Pantophthalmidae (Diptera), with Descriptions of New Species and a New Genus, with 11 Text-figs., by Major E. E. Austen, D.S.O., F.Z.S. (P.Z.S., 1923, p. 551.)
5. The Geographical Races of *Heodes phlaeas* L., with Plate LIV, by Edmund B. Ford, Wadham College, Oxford. (Trans. Ent. Soc. Lond., 1923 (1924), p. 692.)
6. Preliminary Description of a New Spanish Race of *Powellia sao* (Hesperiidae), by B. C. S. Warren, F.E.S. (Entomologist's Record, Vol. xxxvii, 1925, p. 77.)
7. List of Butterflies taken in the extreme North-West corner of the Department of Haute Saône in France, between April 12th and August 7th, 1921, and between May 4th and October 3rd, 1922; with Remarks, by the late F. C. Woodforde, B.A., F.E.S., Exeter Coll., Oxford. (E.M.M., 3rd Ser., Vol. ix, 1923, p. 61.)
8. Some Insects of Historic Interest in the 'Dale' Collection of Exotic Lepidoptera at Oxford, by Commander J. J. Walker, Hon. M.A., R.N., F.L.S. (*Ibid.*, Vol. lxiii, 1927, p. 123.)
9. The Species of *Notogonia* (Hymenoptera, Larridae) occurring in the Mediterranean Basin, by O. W. Richards, M.A., Brasenose Coll., Oxford. (P.Z.S., 1928, p. 357.)
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17. The Rhopalocera of the Mt. Everest 1921 Expedition, with Plates XXXVI, XXXVII, by Capt. N. D. Riley, F.E.S. (Trans. Ent. Soc. Lond., 1922 (1923), p. 461.)
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21. Apterygota from the New Hebrides, with Plates V, VI, by H. Womersley, F.E.S. (Ann. Mag. Nat. Hist., Ser. 10, Vol. II, 1928, p. 55.)
22. On a New Species of Trichothrips from Australia, by R. S. Bagnall, D.Sc., F.E.S., and Reginald Kelly, F.E.S. (E.M.M., Vol. LXV, 1929, p. 90.)
23. Catalogue of the Arachnological Library bequeathed to the University of Oxford by the Rev. Octavius Pickard-Cambridge, M.A., F.R.S. Compiled by his son, Arthur W. Pickard-Cambridge, M.A., F.E.S., Fellow of Balliol College. (Oxford, 1926.)

WILLIAM JOHN BURCHELL

THE MATERIALS OF A LECTURE
DELIVERED BEFORE THE BRITISH ASSOCIATION
IN THE TOWN HALL, CAPE TOWN
ON THURSDAY EVENING, AUGUST 17, 1905

BY
PROFESSOR E. B. POULTON, F.R.S.

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VOL. III. PP. 57 TO 110



WILLIAM JOHN BURCHELL, IN 1816,
The year after his return from the great African journey, June 19, 1811-April 1815.

WILLIAM JOHN BURCHELL

WILLIAM JOHN BURCHELL, by far the most scientific and greatest of the early African explorers, and 'one of the most learned and accomplished travellers of any age or country,' stands apart from the other eminent men of his time, a mysterious, unapproachable, isolated figure. His features at about thirty-four years of age are fortunately preserved for us in an etching by Mrs. Dawson Turner, from a drawing by J. S. Cotman in 1816. It forms one of a hundred portraits of great men drawn by this artist for Mr. Dawson Turner and etched by his wife, the grandmother of Sir Joseph Hooker, to whom I am deeply indebted for the kindest help in the attempt to recover details of Burchell's career. Only forty-nine copies were printed for private distribution, so that the etchings are extremely rare. The fine copy at Oxford (reproduced in the Frontispiece) is in the collection of engraved portraits presented to the University by the Rev. F. W. Hope. The etching, made in the year after his return from the great African journey, brings back to us Burchell's features in the full vigour of manhood. The face is highly intellectual and indicative of strong purpose and resolution, yet singularly attractive, even winning. We see in it evidence of the ample fund of humour which led Burchell to appreciate and to describe many a quaint incongruity in his great 'Travels in the Interior of Southern Africa.'¹ In the drooping eyelids we probably see the result of four years' exposure to an African sun. Burchell himself records that this effect is produced in Bushmen.² His stature

¹ Several examples are quoted in the later pages of this paper. We sometimes recognize a touch like that of Charles Dickens, as in the following passage: 'A colonist . . . paid us a visit, and was invited to dinner; but as he preserved a most extraordinary taciturnity all the time, we learnt nothing from his company, except that he was a tall man in a great *jas* (watch coat), and ate mutton with a crooked knife.'—*Travels in the Interior of Southern Africa*, vol. i. p. 233.

² Vol. i. p. 459, footnote; vol. ii. p. 25.

was short and figure slight, as in many men who have done great deeds.¹

W. J. Burchell, the eldest son of Matthew Burchell, a well-to-do nurseryman at Fulham, was born about the year 1782.² The variety of his accurate observations in many

¹ A letter written by Burchell to his sister Caroline contains the following statement: 'My height is 5 feet 4, measuring very fairly: a string round my waist *under* my waistcoat measures 27 inches, so you may see I am not corpulent.' This letter, kindly lent to me by Mr. Francis A. Burchell, is dated July 14, 1809, from St. Helena, a year before Burchell sailed for South Africa, and when he was about twenty-seven years old.

² We now know that Burchell was born on July 23, although the year still remains uncertain. [Since these words were written the following evidence has come into my hands. Among the papers sent to me by Mr. Francis A. Burchell is a copy of some verses by W. J. Burchell, dated June 31 (*sic*), 1794. The writer, probably Miss Anna Burchell, has added '(age 12½)' to the initials 'W. J. B.' at the foot. If Burchell had been born in 1781 he would have been over twelve years and eleven months old on the quoted date. On the other hand, he would not have been actually twelve years old if born in 1782.] The discovery of his birthday was a direct result of the lecture in Cape Town, as will be seen in the following quotation from the *Proceedings of the Entomological Society of London* for March 7, 1906: 'Professor E. B. Poulton exhibited the original African journal written by W. J. Burchell between May 24 and September 2, 1812, both days inclusive. The account of this part of his journey occupied the whole of a small note-book bound in sheep-skin, and still in the most beautiful condition. In a lecture before the British Association at Cape Town, on August 17 of last year, Professor Poulton had mentioned the unfortunate loss of the journals in which Burchell recorded a general account of his doings during the five years (1810-15) in South Africa, and the five (1825-30) in Brazil. His classical work, *Travels in the Interior of Southern Africa*, does indeed give a complete record between November 26, 1810, and August 3, 1812, the day on which he brought to a conclusion his first visit to Litakun, the capital of the Bachapins, in what is now British Bechuanaland. Mr. S. Mason, headmaster of the Boys' High School at Rondebosch, near Cape Town, who was present at the lecture, told Professor Poulton that a former pupil of his, named Burchell, had brought to school [in Somerset East, Cape Colony] a diary written by an ancestor in St. Helena. Through Mr. Mason's kind help Professor Poulton was put into communication with Mr. Francis A. Burchell, a grand-nephew of the great explorer, who has most kindly lent the deeply interesting note-book now exhibited to the Society. At the place where Burchell's second volume comes to an end the words "end of the 2nd volume" are written in pencil in the margin. Beyond this point, one month of the lost records is here restored to us—from August 3 to September 2, 1812. Furthermore, even in the period covered by the published work there are many statements of the deepest interest to us which Burchell withheld. For the first time we are made acquainted with the day and month of his birth. It is believed—but there is no certainty—that he was born in the year 1782. July 23, 1812, was a day of great anxiety and trouble. Among his attendants was a man named Cornelis, of Hottentot and Dutch parentage. Cornelis had been unsatisfactory and useless from the day of his engagement, when he presented himself "in a state of complete intoxication," and now in the midst of the Bachapin capital, Litakun, then visited for the first time by a European, he broke out into open rebellion, and Burchell was compelled, buckling on his pistols and cutlass, personally to enforce obedience. The published account ends with the words: "Thus ended one of the most turbulent days which I had experienced since the commencement of my journey" (*Travels*, vol. ii. p. 462, London 1824). The manuscript journal, however, concludes the day with the following personal details,

branches of science, the facility with which he wrote Latin and French, as well as the admirable style of his English prose, prove that he received a splendid education; but of the details only a single one has been preserved.¹ His manuscript catalogue of South African insects is written on the blank sides of the pages of his French exercise book—the translation of a history of Greece, made in 1794, when he was about twelve years old. The upper right-hand corner of the first blank page bears the name ‘Burchell’ in a round hand and the date ‘7ber 15th, 1794,’ surrounded by a well-made flourish. On the right side of the heading, ‘Histoire de Grèce,’ which begins with ‘Chapitre cinquième,’ Burchell had written in the hand of his maturity ‘traduite de l’Anglois par W^m. J. Burchell en 1794.’ This inscription is of great interest, being one of many such indications of Burchell’s confidence that a historic interest would at some future time be attached to the details of his career.²

Some of his manuscript botanical notes, made in the opening years of the nineteenth century, are to be seen at Kew, where indeed the work itself had in part been done. These careful descriptions were an excellent preparation for the travels which were soon to begin.

In 1805, when he was about twenty-three, Burchell was appointed ‘Schoolmaster and acting Botanist’ at St. Helena by the East India Company. He remained in the island for five years, until his departure for Cape Town, in order to begin the

omitted from the second volume: “I continued in the waggon all the evening, and to divert my mind from the past I spent the remaining time with my flute.” “It thus has unfortunately happened that I have been prevented joining my family in their remembrances of me on this day, and that my birthday should be marked as one of the most turbulent days I have passed since landing on Africa. From the little dependence I can place on my own people my situation now begins to grow critical, and calls for the most resolute but prudent measures.”

¹ There is now abundant evidence in papers kindly lent to me by Mr. Francis A. Burchell that the great naturalist was educated at the Raleigh House Academy, Mitcham, Surrey. His exercise-book in caligraphy bears, on the first page, amid wonderful and beautifully executed flourishes, the name of the school and the date ‘Christmas, 1794.’ The names of the proprietors appear in Burchell’s St. Helena diary, where he speaks of meeting an old schoolfellow who was with him at ‘Day’s and Rowley’s.’

² See also p. 10. The same well-founded confidence in the value of his accurate and abundant observations breathes in the following words. Before starting from Klaarwater for the dangerous journey into the interior he states: ‘I put in order all my notes and memoranda, my lists and catalogues, my sketches and *journals*: and at last reduced into an intelligible form, the mass of observations which had up to this date been accumulating. So that, in case of my death during the journey, they would, for the greater part, be found sufficiently clear to explain themselves. Thus, if my labors should prove of any value, I had now the satisfaction of knowing that they would not be entirely lost; though I might never live to explain them myself.’—January 26, 1812. *Travels*, vol. i. p. 523.

South African journey.¹ The romance of Burchell's life came to pass in St. Helena, and probably exerted immense indirect influence upon his whole life, explaining much that is difficult to understand, and especially the sad, hard-working, secretive years which followed the return from Brazil in 1830—years which left so much to the world but brought so little honour to the worker. His father had disapproved of Burchell's engagement to a lady in Fulham, and had, perhaps, obtained the appointment in St. Helena, hoping that everything might be forgotten. But the two still corresponded, and Burchell persuaded the lady to come out and join him in the island.² During the voyage someone on the ship—it is said the captain³—paid attention to her, and she gave up the man for whom the voyage had been undertaken. That Burchell was already a keen naturalist and collector the botanical notes at Kew and the collection of British insects at Oxford afford tangible proofs. It is probable that as the first terrible shock passed into a haunting sorrow he was driven into his favourite study and away from the companionship of his fellow-men by a new impulse—the hope of consolation or at least oblivion. It is probable that he became one of those of whom Matthew Arnold has written :—

Fly hence, poor wretch, whoe'er thou art,
Condemned to cast about,
All shipwreck in thy own weak heart,
For comfort from without!

Natural history pursued in this spirit, especially when habits become fixed and deepened with advancing age, and when other sorrows and disappointments are endured, is only too likely to lead to the life of the recluse, labouring for long solitary years at his collections and jealously guarding them from the sight of others. Such effects were wrought in Burchell, and the primary cause is probably to be found in the bitter disappointment of his youth acting upon an intensely

¹ Among the papers lent to me is Burchell's St. Helena Journal. It is much mutilated, evidently by his own hand. Under the date December 13, 1807, he wrote: 'On this day *two*! years I landed at St. Helena.'

² This statement is inaccurate; the true account is given in the following note.

³ I find, from letters kindly lent me by Mr. Francis A. Burchell, and information courteously supplied to me by the India Office, that this statement is correct. It was Captain Luke Dodds, of the 'Walmer Castle,' reaching St. Helena on April 17, 1808, who supplanted Burchell. The lady was Miss Lucia Green, of Fulham. Burchell's father and mother had both disapproved of the engagement, but ultimately relented, and Matthew Burchell with another became bound to the East India Company for Miss Green in the sum of £200. The bond, which is dated November 16, 1807, exists in the India Office.

sensitive sympathetic personality. The man had been deeply wounded in his most vulnerable part.

It seems likely that Burchell was thinking of his own sad experience when he speaks (in vol. ii. p. 565) of the marriage customs of the Bachapin nation. So far as he could ascertain 'there were scarcely a dozen men among the whole tribe, who were not married,' and this, he maintained, only appears extraordinary to the native of a civilized country, 'where the artificial state of society renders that union an affair of the head rather than of the heart, and where calculating prudence often steps forward to forbid it altogether. . . . On this point the savage stands superior, and here he seems, according to the law of Nature, wiser than the polished inhabitant of a more civilized land.'

During the five years in St. Helena, Burchell collected both plants and insects. His Herbarium, with its manuscript notes and drawings, is at Kew; a few fragments of the insects came to Oxford in 1865; but it is probable that this collection was never large. The type of that wonderful island form, the large Carabid beetle, *Haplothorax burchelli*, is fortunately in very good condition, inasmuch as the Rev. F. W. Hope had, probably accidentally, retained the specimen in his well cared for collection.

Burchell was the only passenger in a ship which sailed from St. Helena and landed at Cape Town on November 26, 1810. From this date up to August 3, 1812, his laborious life, crowded with observation and discovery, and the cares of leadership under extraordinary difficulties, is admirably described in that great classic 'Travels in the Interior of Southern Africa,' of which the first volume appeared in 1822, the second in 1824.¹ The publishers, Messrs. Longmans, have kindly furnished me with some information concerning the production of this remarkable and invaluable work. The firm paid Burchell £1,500 for writing it, and he contributed the cost of ten woodcuts in the second volume. The plates and woodcuts cost nearly £500 in the first and over £250 in the second volume. The published price was 4½ guineas for each of the (quarto) volumes. It is not known whether the book was a financial success; but the sale was not so large as had been anticipated; for 750 copies of the first volume were followed, four years later, by only 500 of the second. The sums paid to the

¹ 'His narrative may be ranked among the classics of English travels, from its simple, vigorous, and truthful style, and its numerous illustrations, made with scrupulous fidelity on wood and stone by his own hands.'—Sir Roderick J. Murchison, *Anniv. Addr. to the Roy. Geol. Soc.*, May 25, 1863, p. cxxiv.

author and for the illustration of the work appear astonishing to us at the present day : yet they were expended as a fair business risk in the lean years following the Titanic struggle with Napoleon. This was before the dominion of the circulating library, at a time when the possession of books was a pride and pleasure to those who could afford to buy them. No second edition has appeared ; and inasmuch as the original issue has long been out of print and both difficult and costly to obtain, Burchell's splendid achievements and priceless records are very insufficiently known and appreciated.

A most interesting question arises as to why the work treats of less than half the time spent and the space traversed, ending abruptly with the close of Burchell's first visit to Litakun, the capital of the Bachapin nation, omitting all account of his ' furthest north ' at the Maadji Mountain and the Chué Spring, his first encounter with the giraffe and the elephant, and his discovery of the so-called ' white ' rhinoceros (*R. simus* of Burchell). A copy of his ' Travels,' generously presented to the Hope Department of the Oxford University Museum by Mr. J. W. Mansel Wcale, throws interesting light upon this problem. It was Burchell's private copy, carefully corrected and annotated by his own hand—in all probability for a second edition which never appeared. In the first volume there are several references to parts of his journal beyond the point at which the second volume comes to an end—references worded so as to raise the expectation that a full account of the incident would appear in due course in a later part of the work. Such references have generally been struck out by the author himself in the Hope Department copy. It is evident that Burchell's first intention was to cover much more of the ground, perhaps the whole of it, but that his materials occupied more space than he anticipated and probably more than his publishers were willing to grant.

Up to the present time the manuscript journal of Burchell's African travels after August 3, 1812, has not been recovered,¹ and the same is unfortunately true of that dealing with the whole of his Brazilian journey (1825 to 1830). After his tragic death by his own hand in 1863, at the age of about eighty, his zoological collections and manuscripts were presented in 1865 by his sister to Oxford, his herbaria and botanical notes and drawings to Kew ; but of the remaining manuscript, drawings and notes almost nothing is known. We may still hope that they have not been destroyed. The missing journals and other

¹ The record of the first month after the departure from Litakun has now been discovered by Mr. Francis A. Burchell. See footnote 2, on p. 4.

manuscripts—altogether a very large amount—may still be lying unrecognized in the house of some member of the Burchell family or that of a descendant. Wherever it may be its recovery would be of inestimable value to science.¹

Burchell remained in Cape Town from November 26, 1810, to June 19, 1811, when he started on his great journey of 4,500 miles. During these seven months he was occupied in studying the South African and the Hottentot dialects of Dutch, in making collections, especially of plants, in engaging Hottentots and making other preparations for the journey. His home in Cape Town was under the hospitable roof of the Rev. C. H. F. Hesse, the Lutheran minister. He made short excursions to the summit of Table Mountain, to Constantia and Wynberg; and took one long ride (April 10 to 21, 1811) through Hottentot Holland, Zwarteberg, Genadendal, the Brandt Valley, Tulbagh, the Paarl and Stellenbosch. Some of the illustrations of Cape Town were drawn by Burchell during these months, others in 1815, after the return from his great journey. The eighth chapter is chiefly occupied with an excellent and detailed account of the construction and contents of Burchell's Cape wagon, and a description of the Hottentots he was able to engage for the journey. In spite of many inquiries and every effort he only secured the services of four, two of whom refused to travel beyond their homes at Klaarwater (the Hottentot Karrikamma, the modern Griquatown). By far the most interesting member of the group was Stoffel Speelman, a great hunter and naturalist, very efficient in collecting specimens of all kinds. His name occurs frequently not only in the published work but in the manuscript records. His wife, Hannah, was also a member of the party. Although a European 'very earnestly volunteered his services as . . . companion and assistant' Burchell considered it wiser to confine his party to the paid native attendants, of whom the number never at any time exceeded ten. He adhered to the same principle in his Brazilian travels. As Burchell watched his wagon start, he tells us, he little supposed 'that it would ever pass that castle again; or that, out of the whole party who were now to accompany it, I should be the only person to return with it.' From this we learn that the well-made wagon, which he had hoped and expected to take to the West Coast, successfully accomplished the four years' journey of 4,500 miles and returned

¹ These words were written before I knew of the great mass of valuable material traced by Mr. Francis A. Burchell, and the large number of deeply interesting drawings in the possession of the Rev. Evan Davies, of Springs, Transvaal. Up to the present time (October 1906), however, no African or Brazilian journal has been recovered other than that described in footnote 2, on p. 14.

safely to Cape Town. The oxen, the wagon and its contents had cost Burchell up to the day of his departure from Cape Town £600.

Among the articles packed in the wagon were more than fifty volumes, including Jussieu, 'Genera Plantarum,' ed. Usteri. This very copy was found on a bookstall by Mr. Edward M. Langley, of Bedford, who generously presented it to the Hope Department Library. It bears the following inscription :—

Hunc librum in itineribus suis
in Africa australi annis 1810 ad 1815
et in Brasilia annis 1825 ad 1830 semper
secum habuit Gulielm. Johan. Burchell.

The handwriting is that of Burchell's old age, with the ink still black and fresh, showing that it was written during the last years of his life. It affords further evidence of his conviction that he had done historic work. There can be little doubt that similar inscriptions were written in the other volumes mentioned in his eighth chapter (p. 165), and perhaps in all that he took.

In the list of articles given by Burchell are included 'the English Colors.' He tells us that outside the Colonial boundary the flag was hoisted every Sunday, and he speaks of the feelings with which he saw it waving above his head in the middle of an African town.¹ That such a symbol was not without its effect far beyond the Colony even 100 years ago is shown by the fact that Mollemmi, the brother of the Bachapin paramount chief, noticed that Burchell's flag in 1812 was the same as that brought in 1801, but different from that of 1805, during the retrocession to the Dutch.²

Not only this custom but many a statement in his writings proves that Burchell was an Englishman inspired with a patriotism all the more real because it had a place in a mind of peculiar sanity and breadth. 'An *Englishman*,' he says, 'who is dissatisfied with his own country, needs only to witness a lawless state of society and the mis-rule of many other nations, to make him turn with affection to his own, and forgive those errors to which all humanity and the wisest of men, are liable.'³

By constitution Burchell was eminently fitted to be an explorer. With but few exceptions he kept in vigorous health during both his great journeys, a result which in Africa he 'attributed in a great degree to the general dryness of the

¹ Vol. ii. p. 426.

² Vol. ii. p. 429.

³ Vol. ii. p. 281.

air.'¹ Burchell possessed furthermore a rare qualification, but one that is essential to a great traveller, viz. well-nigh unlimited resource in unexpected difficulties. Thus when in taking an observation he accidentally spilt half the mercury on a surface of loose sand, he instantly made a hollow near the spot, placed a sheepskin in it and quickly scooped into the basin thus formed all the sand where the mercury had fallen. 'Then, by taking in a cup small quantities of this sand, and giving it a circular motion, at the same time blowing away the dust and lighter particles, the quicksilver was found clean at the bottom; and in this manner, persevering at every leisure moment for three whole days, I had the satisfaction, at last, to recover very nearly all that had been spilled.'²

We may safely infer from a sentence in his great work that, in spite of his numerous and changing body of attendants, no life was lost throughout the whole of his African travels.³

During these seven months in Cape Town there were three shocks of earthquake—a slight one on January 7, 1811, more severe ones on June 2 and on the morning of June 19, the day of Burchell's departure. Mr. Anderson, a Klaarwater missionary, arranged to accompany Burchell as far as this settlement, the two parties affording each other mutual support during the journey through the country of the Bushmen beyond the Zak River, the northern boundary of the Colony. The first woodcut (on p. 172) illustrating the journey, represents one of their night encampments, and shows Burchell sitting by the fire playing his flute, an instrument which was the solace of his travels in Brazil as well as in Africa. In Burchell's third Plate, representing the crossing of the Berg River on June 23, the author himself is seen standing on the shore, his drawing board (see vol. i. p. 336) in his hand, and his dog sitting by his side. He has similarly inserted a back view of the artist seated under an umbrella in the picture of Cape Town in his first Plate.

A little way beyond the Berg River on June 25 Burchell experienced the attitude of a Boer farmer towards the new (British) Government. It is best given in his own words: 'I walked to the house of *Piet Van der Merwe*, a neighbouring farmer, to inquire for a new pole for the waggon, and fortunately obtained one. He told my fellow-traveller [Mr. Anderson], that he had heard there was an Englishman on the road, who had general orders from government, authorizing him to demand such assistance as he might stand in need of, but he candidly confessed that had I made use of it on this

¹ Vol. i. p. 275.

² Vol. i. p. 230.

³ Vol. i. the last sentence on p. 477.

occasion, I should not have been able to persuade him to do anything, as he would in that case have pleaded a hurt in his hand, as an excuse for not lending us any help at the forge; but that, as I had asked it as a favor, he willingly sold me the pole, and would freely give his assistance.¹ This, however, is the only example of such an attitude recorded by Burchell. From time to time he met with churlishness, such as might have led a narrower man to make sweeping reflections upon a whole people. A good example of the fairness of his mind is to be seen in a passage referring to grossly inhospitable treatment received near Graaff Reinet: 'As the events of these travels are, without partiality or prejudice, related as they occurred, and the observations recorded faithfully in that light in which they appeared, I cannot allow the unfavorable qualities of an individual, to be adopted as the *general character* of the Dutch colonists, any more than I would admit selected examples of individual worthiness, to be taken as specimens of the whole colony. Of the latter, I know many: of the former, I wish that I knew none.'²

At Tulbagh, on June 27, he was joined by another Hottentot, Gert Roodezand, sent by the Moravian missionaries at Groene-Kloof; and on the 29th, at Winterhoek, he purchased a second much smaller wagon.

On July 24 Burchell wanted to buy a horse from Veldcornet Gerrit Snyman, in the Roggeveld, but declined when he found that three-fifths more than the usual price was required. However for eighteen sheep 'he was so conscientious as to lay on no more than an eighth, as the charge for my being an Englishman: this I thought very moderate for such a privilege.'³

Burchell first saw the ostrich in a wild state four hours' journey south-west of the Karroo Poort (July 9). On the 19th at Juk River, just beyond the Ongeluks River and near the Koedoes Mountains, he was overtaken by two 'tame Bushmen,' a chief and his companion, riding oxen. The chief carried as an ensign of authority a staff with an inscribed brass top. They belonged to a kraal just within the Colonial boundary, and had been the bearers of a letter to the landdrost of Tulbagh, requesting protection for themselves and the neighbouring farmers against an invading party of Kaffirs. Such recognition and successful co-operation was common in those days, and deepens the regret at the entire disappearance, from all but the most remote areas, of this primitive and intensely interesting people. This was Burchell's first acquaintance with

¹ Vol. i. p. 180.

² Vol. ii. p. 96.

³ Vol. i. pp. 239, 240.

a race which had been pictured to him 'in the most wretched colours.' So far, however, from finding them as he had been led to expect, 'without reason or intellect,' they seemed to him 'men of lively manners and understandings.' They did not wear the primitive dress unmodified; but on September 8, not far beyond the Colonial boundary, the wagons were visited by a party of eleven wild Bushmen and three women. Burchell's drawing of one of the women with her child at her back is represented in the woodcut on p. 322, vol. i., and this shows the primitive leathern clothing, consisting of a kaross, or cloak, and the fore-kaross in the form of an apron cut into thin strips. The hind-kaross, used as a cushion when sitting on the ground, is invisible in the front view depicted in the woodcut. Burchell observed that all the men were under 5 feet in height and the women still shorter. He was much struck with 'the proportional smallness and neatness of their hands and feet'—also recorded on other occasions as true of the Hottentots as well as the Bushmen.

On September 4, 1811, four days before meeting this last party of Bushmen, the footmarks of a lion were seen for the first time. Burchell was then a few miles beyond the borders of the Colony.

Burchell's chief wagon, the flock of sheep, the dogs and Hottentot attendants, backed by the remarkable series of flat-topped mountains of the Karreebergen, are well shown in the woodcut on p. 285 of vol. i. The drawing was made on September 11 as they were traversing a plain a few miles north of Carnarvon. The mountains shown in the figure were those on the left hand, but similar forms bounded the plain on their right.

Just beyond these mountains an incident occurred which Burchell treats with characteristic humour. On the night of September 12 they were in much need of water and were hurrying over an immense plain between the Karreebergen and the Orange River. Suddenly Burchell and his companions 'heard the cry of *Whoo-āh! Whoo-āh!* from several drivers in the rear.' Thinking of an attack by Bushmen or some wild beast, 'we,' to use Burchell's own words, 'ran back to their assistance with loaded guns in our hand; but our fears were soon relieved, on being told, as we approached, that it was nothing of this kind: and yet, the *accouchement* of one of the Hottentot ladies, was certainly an occurrence that happened very awkwardly just at this time, and in such a spot.'¹

At Zand Valley (Vlei), or Sand Pool, a few miles south-west

¹ Vol. i. p. 305.

of Prieska, Burchell made, on September 14, some observations which show how he appreciated the importance of the struggle for existence. He found a *Mesembryanthemum* (*M. turbini-forme*, now *M. truncatum*) and also a *Gryllus* (Acridian), closely resembling the pebbles with which their locality was strewn. He says of both of these, 'The intention of Nature, in these instances, seems to have been the same as when she gave to the Chameleon the power of accommodating its color, in a certain degree, to that of the object nearest to it, in order to compensate for the deficiency of its locomotive powers. By their form and color this insect may pass unobserved by those birds, which otherwise would soon extirpate a species so little able to elude its pursuers, and this juicy little *Mesembryanthemum* may generally escape the notice of cattle and wild animals.'¹ He here seems to miss, at least in part, the meaning of the relationship between the quiescence of the Acridian and its cryptic colouring. Quiescence is an essential element in the protective resemblance to a stone—probably even more indispensable than the details of the form and colouring. Although Burchell appears to overlook this point he fully recognized the community between protection by concealment and more aggressive modes of defence; for, in the passage quoted above, he specially refers to some earlier remarks on p. 226 of vol. i. We here find that when the oxen were resting by the Juk River, on July 19, Burchell observed '*Geranium spinosum*, with a fleshy stem and large white flowers . . . ; and a succulent species of *Pelargonium* . . . so well defended by the old panicles, grown to hard woody thorns, that no cattle could browse upon it.' He goes on to say, 'In this arid country, where every juicy vegetable would soon be eaten up by the wild animals, the Great Creating Power, with all-provident wisdom, has given to such plants either an acrid or poisonous juice, or sharp thorns, to preserve the species from annihilation . . .' All these modes of defence, especially adapted to a desert environment, have since been generally recognized and illustrated by many fresh examples, but Burchell was by a long way the first to observe the facts and establish the principle. Many instances are to be seen in the fine collection of Karroo plants at Kew, and Sir William Thiselton-Dyer has very kindly given me photographs of the most beautiful examples, taken expressly for this lecture.² It is fortunately possible to determine the species of

¹ Vol. i. pp. 310. 311.

² The lecture delivered in Cape Town on Thursday evening, August 17, 1905. These photographs have been since reproduced as Plates VII., VIII., and IX. accompanying Sir W. T. Thiselton-Dyer's *Morphological Notes*, xi.; *Protective Adaptations*, i.; *Annals of Botany*, vol. xx. pp. 123 *et seq.* The author well

'Gryllus' mentioned by Burchell. The Orthoptera of his African collection at Oxford are in very bad condition, and a large proportion have been entirely destroyed by moth or beetle. Among them No. 752 is, however, easily recognizable as the Acridian, *Methone anderssoni* of Stål, a species since known to be protected by its resemblance to stones. Referring to Burchell's manuscript catalogue of African insects we find that No. 752 was captured on September 14, 1811, at 'Zand Valley, near the Gariep,' so that there can be no doubt that we have here the actual specimen referred to by Burchell on pp. 310, 311 of the first volume of his work.

Burchell reached the Gariep (Orange River) on September 16, his 'Gariep Station' occupying the site of Prieska. On the following day he crossed the stream 9 miles higher up, at 'Shallow Ford,' where the water was at that time nowhere deeper than 2 feet 8 inches. After travelling northward throughout the night of the 18th he reached about sunrise

says of Burchell's remarks on *Mesembryanthemum turbiniforme (truncatum)*, 'Burchell was clearly on the track on which Darwin reached the goal. But the time had not come for emancipation from the old teleology. This, however, in no respect detracts from the merit or value of his work. For, as Huxley has pointed out (*Life and Letters*, vol. i. p. 457), the facts of the old teleology are immediately transferable to Darwinism, which simply supplies them with a natural in place of a supernatural explanation' (*l.c.* p. 124). In Plate IX. the author represents *Anacampseros papyracea*, and speaking of its protective resemblance says, 'At the risk of suggesting one perhaps somewhat far-fetched, I must confess that the aspect of the plant always calls to my mind the dejecta of some bird, and the more so owing to the whitening of the branches towards the tips' (*l.c.* p. 126). The student of insects, who is so familiar with this very form of protective resemblance in larvæ, pupæ, and even perfect insects, will not be inclined offhand to consider the suggestion far-fetched; and it is deeply interesting to learn that it was made, although never published, by Burchell himself.

In the journal kindly lent me by Mr. Francis A. Burchell the following account is found, under the date July 5, 1812, when Burchell was at the Makkwárin River, about half-way between the Kuruman River and Litakun:—

'I found a curious little *Crassula* (not in flower), so snow white, that I should never has [have] distinguished it from the white limestones, (*amongst which I observe small pieces of black flint or feldspar imbedded*). *It was an inch high and a little branchy, teres foliis squamoso-imbricatis and was at first mistaken for the dung of birds of the passerine order.* I have often had occasion to remark that in stony place[s] there grow many small succulent plants and abound insects (chiefly Grylli) which have exactly the same color as the ground and must for ever escape observation unless a person sit on the ground and observe very attentively.'

Burchell carefully marked with pencil those parts of his journal which he employed in writing his *Travels*. The words I have put in italics are thus shown to have been excluded, the others included. In the former we note the recognition of cryptic resemblance to birds' dung. The words before the two italicized sentences, and included in the second, were made use of in writing p. 333 of vol. ii., but the observation is recorded for July 8, 1812, and not the 5th, and an *Anacampseros* is spoken of as well as a *Crassula*. Reference to Burchell's African Herbarium at Kew will probably show which of these dates is the correct one. The last sentence above quoted is also utilized on p. 333, but the reference to 'stony places' and to 'Grylli' will be found in vol. i. p. 310, in part quoted on p. 14.

the Hottentot village of The Kloof, in the Asbestos Mountains. Although under the influence of the missionaries at Klaarwater, most of the Hottentots lived in the primitive hemispherical mat-huts, of which a group is well shown in the wood engraving on p. 323 of vol. i. Burchell states that these huts, in the form of an inverted basket, are quite peculiar to the Hottentots and Bushmen, and are well suited for their roving, pastoral life, inasmuch as one can be taken to pieces in an hour, and, with all utensils and the young children of a family, carried by a couple of oxen.

This was well illustrated a few months later, when, on February 18, 1812, Burchell met a party of Hottentots moving their habitations and all their goods from Klaarwater to the Asbestos Mountains. 'The whole family, with mats, sticks, utensils, and skins, packed all together on the backs of the oxen, and moving along with a steady pace, presented a curious group, which might have been fancied to bear some resemblance to the journeyings of the people of patriarchal days, notwithstanding the dignity, and splendid robes, with which modern painters have thought proper to invest them.'¹

After spending several days at The Kloof, Burchell travelled north-east, on September 29 and 30, reaching Klaarwater at night. A beautiful and detailed view of the settlement, looking north-east from a low rocky ridge which bounds it on the west, is given by Burchell in his Plate VIII. Mr. Anderson, the missionary already spoken of, had also asked Burchell to make him a drawing of the place. 'With this,' says Burchell, 'I readily complied, as he engaged expressly that it should not be sent to Europe before I arrived there myself, and that it should not, at all events be engraved from.' So far from this promise being kept, Burchell states in a footnote to p. 243, vol. ii., that on his return to Cape Town in 1815 the drawing had been sent to England, and 'had even made its way back again; and was recognised in the form of a print engraved to be the principal ornament of a book of Missionary Travels by a person who visited Klaarwater five months after I finally left it, and who so much admired this drawing, that he thought it worthy of being published as his own.' At the end of this footnote Burchell wrote in pencil in his corrected copy, 'Vide Frontispiece to *Campbell's Travels in South Africa*' (London 1815). The reference to the frontispiece is a mistake, for this is occupied by a gigantic representation of the worthy missionary under his umbrella against a background of Orange River scenery, strewn with diminutive oxen, wagons, Hottentots, huts and a giraffe. The plate engraved from Bur-

¹ Vol. i. p. 549.

chell's drawing (opposite p. 221) is, however, certainly the 'principal ornament' of the work. Comparing it carefully with Burchell's plate it is seen to be a view looking south-east, taken from a more northerly part of the same ridge, and one much nearer to the old church and foundations of the new building, which become far more prominent and central features. It bears the date of publication, January 16, 1814, and the name 'Griquatown Missionary Settlement beyond the Great River.' This unfortunate adoption of a modern uninteresting name is explained by Mr. Campbell, and was indeed, as his own account shows, promoted by him. The inhabitants of the village and surrounding districts, not being a pure race, were called 'Bastard Hottentots,' although Burchell speaks of them by the more euphonious and more accurate term 'Mixed Hottentots.' The offensive implication of the former word, Campbell tells us, was explained to those who bore it. In consequence of this information they determined to be called Griquas, because the majority of them were descended from a person of the name of Griqua.¹ This decision was confirmed at a meeting held at Klaarwater on August 7, 1813, when the unfortunate and unnecessary change was made in the name of the place.² It was not, however, by any means fully accepted for a long time; for Livingstone's map, dated 1857, gives the name Klaarwater. This illustrious man must of course have known of the change, but preferred to preserve the translation of the primitive name. Is it too much to hope that a return may be yet possible not indeed to Klaarwater, but to the original Hottentot Karrikamma? Other names invented by Campbell, and they are very numerous, have fortunately passed into oblivion. The most gross example was his attempt to give the name Alexander River to the Modder (now the Riet) and Cradock River to the Orange above the confluence of the Vaal. The spirit in which he approached the investigation of native names is sufficiently obvious in the following naïve remark: 'Of course they had no names for them, except that they spoke of this as the mud and the other as the black river.'³ Campbell's plates, when dependent on his own skill as an artist, are well exemplified in the one representing the two rivers.⁴ It may advantageously be compared with the plate copied without acknowledgment from Burchell. As to these and other unfortunately more successful attempts to impose modern names unnecessarily, it is much to be hoped, and, I believe, it is to be confidently expected, that the scientific spirit

¹ Campbell, *Travels in South Africa*, p. 349, London 1815.

L.c. p. 351.

³ *L.c.* p. 342.

⁴ *L.c.* opposite p. 342.

which animated Burchell may have greater and more widespread influence in the future than it has had in the past. Upon this subject he says, 'The aboriginal Hottentot names ought, on no account, to be altered; they should, on the contrary, rather be sought for, and adopted, as being far more appropriate to Southern Africa, than a multitude of foolish names of modern imposition.'¹ And again, 'It is certainly bad taste to substitute, in any country, a modern or a foreign name, for one by which a place has been for ages known to its native inhabitants. I cannot consider myself as falling under this remark when, not having been able to learn the true name, I have been under the necessity of giving a *temporary* one to some of my stations, in order to note afterwards, more precisely, the spot where particular objects of natural history were found.'²

After remaining in Klaarwater till October 24, and finding that his oxen would require much more rest before they could resume the northward journey, Burchell hired another team and started to explore the junctions of the Modder (Riet) with the Vaal, and the Vaal with the Gariep (Orange). He was accompanied by three dogs, one of which, named 'Wantrouw,' he employed for the purpose of controversial attack. After a humorous history of the dog up to the point at which 'he offered himself . . . as comparative anatomist to the expedition,' Burchell continues, 'Wantrouw had prepared and cleaned a large collection of bones of rare quadrupeds, which would have been to any museum a valuable present. Or, to the great extension and benefit of science in England, they might have been deposited in the cellars of the British Museum, to receive the same honors with his master's skins. But as they would require no stuffing, and consequently would not put that establishment to any expense, it is very probable that the public would soon be gratified with the sight of them.'³ Then in a note he adds the facts concerning the neglect of the specimens he had presented. In the second volume (pp. 336, 337, footnote) he shows that neglect had produced its inevitable result—injury. A manuscript note of his visit to the British Museum on July 27, 1822, is fixed into his catalogue of African insects, and it includes a few unpublished details. *Antilope* (now *Damaliscus*) *lunatus*, of which the skin was irretrievably damaged, was the type of the species and the only specimen obtained in the whole of the travels. It was shot by 'Juli' on July 9, 1812.⁴ Mr. Oldfield Thomas, F.R.S., informs me that the frontlet and horns are fortunately still in existence.

¹ Vol. i. p. 100.

³ Vol. i. pp. 383, 384.

² Vol. i. p. 286.

⁴ Vol. ii. p. 334.

These attacks were certainly just, and the British Museum authorities would now be the first to lament the neglect of their predecessors. But at the time much resentment was felt, and the name of the well known 'Burchell's zebra,' *Asinus burchellii*, was given in 1825 by J. E. Gray, Keeper of the Zoological Collections, in the successful effort to cause annoyance. The history of the name itself is of some interest and affords a good example of the difficulties which beset the path of the systematic naturalist. Burchell recognized three species of zebra—the quagga, the zebra of the plains, and the zebra of the mountains. Believing that Linnæus had described as *Equus zebra* the zebra of the plains, Burchell pointed out the differences between it and the mountain species, which he named *Equus montanus*.¹ It ultimately appeared, however, that Linnæus had described this latter form; consequently *Equus montanus* became a synonym of *Equus zebra*, while the species of the plains was left without a name until described as *Asinus* (later *Equus*) *burchellii* by J. E. Gray. The 'irony of fate' has willed it that a name given in insult should have become the popular title to fame of this great but insufficiently appreciated naturalist.

Wantrouw was also employed in another and entirely different attack arising out of a subject of high importance in the history of South Africa. Just before the close of the session of Parliament in 1819 Burchell was asked to give evidence before a committee of the House of Commons on 'the question of emigration as a relief to the distressing increase of pauperism from want of employment.'² In his evidence, which occupied three hours, Burchell maintained that there was abundant room for the establishment of an English settlement in the Grahamstown district, and that further extension could be gained, if necessary, by purchasing land to the east from the Kaffirs, and beyond the northern boundary of Cape Colony. The Committee reported in a few days, and the House granted £50,000 to convey the new settlers. Thus Burchell's advice played an important part in the development of a dominant English element in this part of the Colony. In August of the same year he published his views on the subject in a pamphlet entitled 'Hints on Emigration to the Cape of Good Hope.' This memoir was grossly misrepresented and savagely attacked by Barrow—afterwards Sir John Barrow—in the 'Quarterly Review' for the following November. Burchell replied in a sheet of four pages bound into the first volume of his 'Southern Africa.' He also takes the opportunity of attack-

¹ Vol. i. p. 139.

² P. 1 of the four-page sheet bound at the end of vol. i.

ing Barrow's 'Travels in South Africa' at several places in the body of the work; and here in this mock account of his dog he suggests that Wantrouw's adventures would make a good thick quarto, 'if dished up in good language, by some writer acquainted with the art of book-making . . . ; at the same time taking care to have it properly recommended in the "Quarterly Review."' It is to be noted here that the 'Quarterly' Reviewer who attacked Burchell's pamphlet always spoke very highly of Barrow's 'Travels.' 'Although *Wantrouw* had not the least notion of drawing, yet a few aquatinta plates, or lithographic prints, should, by all means, be inserted; these, his publisher could easily get designed by some artist, who must be told to take especial care that the words *Wantrouw delineavit*, or, *From a sketch, by Wantrouw, Esq.*, appear conspicuous at the bottom corner. Such a work, if rightly and humbly dedicated, and well advertised, would be sure to sell.'¹ I think there is little doubt that Burchell was struck with the humorous inappropriateness of the name Barrow, or Bar-row, for one who made so unprovoked an attack. *Wantrouw*, or *Want-row*, seemed much more suitable. In justice to Barrow it must be pointed out that his plates, although not his own, are certainly not passed off as his own. In following such mutual recriminations we must remember that it was an age of embittered and not too scrupulous controversy.

Starting on October 24 Burchell returned to *Klaarwater* on November 19. The woodcut on p. 381 of vol. i. shows his wagon flying the British flag on the north bank of the *Ky-Gariep* (*Vaal*), just above its junction with the *Nu-Gariep* (*Orange River*). Burchell himself is seen distributing presents to a party of Bushmen who visited him. After staying here a couple of days (October 26 and 27) he moved up the north bank of the *Vaal* until opposite to the *Maap* or *Modder River*, now unfortunately known on the Government maps by the name of its southern tributary, the *Riet*. Burchell's account is confirmed by the quotation already made from Campbell and by Moffat's map, dated 1842. It is greatly to be hoped that the original name may be restored, and the *Riet* restricted to the branch from the south which unites at *Modder River Station*. Three hippopotami were shot in the *Vaal* above the junction of the *Modder*, and Burchell made a drawing of the head, and secured a quantity of dried meat. He never crossed to the southern shore on this excursion. He then returned and remained several days at his old camp opposite the mouth of the *Modder*, and on November 13 started on the return journey by a more

northerly route, passing through Groote Fontein (now Campbell), where he stayed a few days, and then travelled to Klaarwater. On this expedition he greatly increased his knowledge of the wild Bushmen and Bushwomen, and had an opportunity of hearing the gorah and of making a drawing of the performer.

On the return journey Burchell mistook the termitaria, shown in the woodcut on p. 446, vol. i., for anthills, and drew a fragment of one of them with a true ant upon it (p. 449), as if it had been the builder instead of an intruder. Such a mistake was probably common at the time, and even at the present day termites are called 'white ants.'

On the morning of November 21 Gert's right hand was blown to pieces by the bursting of a gun he had fired to drive the crows from the stock of dried meat. In treating it, Burchell paid strict attention to cleanliness, and undesignedly adopted antiseptic methods so far as they could be carried out under the circumstances. In the end he was able to say, 'I saw reason for rejoicing that I possessed neither the instruments nor the skill of a surgeon; for, otherwise my poor Hottentot would have been all the remainder of his life with a useless stump, instead of half a hand.'¹ The whole story, which he gives in detail for the benefit of other travellers, is an admirable instance of resource under unfavourable conditions. Gert's watching and injury were all to no purpose, for the large stock of dried meat was begged and stolen by the Klaarwater Hottentots within four days of Burchell's return.

The excessive dryness of the air at Klaarwater was forcibly brought to Burchell's attention on December 7, when the upper joint of his flute split with a sudden crack.

Burchell had confided to the missionaries his intention of travelling far north of Litakun; and he began to be aware at the end of the year 1811 that the Hottentots of the settlement were being influenced, so as to prevent them from accepting any positive engagement to accompany him. They had been told that Burchell intended to take the same route as the disastrous expedition under Dr. Cowan and Captain Donovan, which started for Mozambique from Cape Town in September 1808, reached the river Molappo on December 24, but had not since been heard of. Burchell therefore caused it to be widely known that he should not run into any obvious danger and would turn back in the face of evident risk; furthermore, that he had no intention of following the track of these unfortunate travellers. It has been already pointed out that he desired to go north-west and not north-east. Burchell also appealed to

¹ Vol. i. p. 481.

the missionaries, without success. They were not unnaturally influenced by the fact that they had permitted two of the Klaarwater Hottentots to accompany Dr. Cowan's expedition. By the end of January 1812 Gert had entirely recovered and the oxen were in a very satisfactory condition. Furthermore, five Klaarwater men had agreed to go with him, including Muchunka, a Bachapin who would act as interpreter. With his own three Hottentots this would make eight, an insufficient number, but one which he hoped to increase as he proceeded. At the beginning of February, however, an unfounded rumour that 'Africaaner' (or 'Africaander'), a noted Hottentot brigand, was lying in wait for Burchell, caused the missionaries to use every effort to prevent his journey to the north. They told him that not one of the Klaarwater men would proceed beyond Litakun, and this Burchell found to be only too true. He then thought of sending Gert to Cape Town to hire men. Several times the idea of travelling there himself for the same purpose presented itself; but finally, on February 5, he fixed on the village of Graaff Reinet¹ as being much nearer to Klaarwater, although separated from it by an unknown tract of country inhabited by Bushmen. Here, however, he again encountered the strong opposition of the missionaries, who did not want a road to be opened in that direction, and, evidently under their influence, a number of men who had consented to accompany him withdrew from their agreements. Burchell now perceived that he would never succeed in getting men at Klaarwater, and he therefore paid a secret visit (February 15) to the outlying village of The Kloof, and obtained the services of two men—Cobus Berends, an old Hottentot, apparently about seventy, and Ruiter, who, being a half-Bushman, was valuable as an interpreter. Two more Hottentots had been obtained from Groote-doorn, where the oxen were recruited, and these brought with them a Bushman and a half-Hottentot named Daniel Kaffer, who were added to the party. Thus Burchell started on February 24, 1812, to open up the new road with six men, in addition to his two former attendants, Speelman and Philip. Gert and Hannah were left to take care of the wagons, as the party were travelling with pack-oxen, riding-oxen, and, for Burchell himself, a horse, kindly lent by the missionary Mr. Jansz, when he saw that nothing would prevent the journey. Burchell took his wagon as far as the Gariiep, and on the eve of their crossing Gert begged in the name of the rest that they might hear a last performance on the flute. Burchell, who was not taking the instrument beyond the river, readily consented, and he tells us

¹ Spelt Graaffreynét by Burchell.

that he never before felt so satisfied and proud of his own performance. The following morning, February 27, they constructed rafts and crossed at the spot¹ forded by Dr. Cowan's ill-fated expedition. They required the help of a kraal of mixed Hottentots living near the river, and three passages were necessary. After the first was completed, and the party and goods divided, these men demanded payment in gunpowder, which Burchell could ill spare, but was compelled to give. On the next day the party moved west to the kraal of a Bushman named Riizo, where they stayed the night. Riizo himself was absent, but Burchell, having left a message to urge him to join them, started south for the Brak River (February 29, 1812). The next day Riizo overtook them, accompanied by Kaabi, the chief of a large Bushmen's Kraal lying in the direction Burchell proposed to take. Kaabi also brought three Bushmen and three Bushwomen, including his wife. The latter and one of the other women each carried an infant at her back. By March 2 the party had passed the furthest point known to the Klaarwater Hottentots. The journey was undertaken with a minimum of baggage—viz. watch coats, guns and ammunition, a hatchet, a small tin pot, a tea-kettle, a bag of biscuits, five sheep, and tobacco to give the Bushmen. For Burchell's own use were added three small² blankets, an umbrella, one tin box holding papers, journal, sketches, compass, &c., and another with a change of linen and medicines. Their stock of food was increased by finding an ostrich's nest with twenty-five eggs, and nine more in the trench outside. The course lay S.S.E., following the direction of the Brak River, which was crossed several times and finally quitted on March 14. Three days later they recognized by the remains of an old cattle station that they had entered the northern boundary of the Colony. At three different points near the Brak River Burchell visited the kraals of Bushmen, whom he made happy with presents of tobacco and meat. At all he was received in the most friendly spirit, and admitted freely and intimately into the life of the kraal.³ Hence his records of this wild and timid people are of the utmost value. At two kraals he witnessed dancing to a vocal accompaniment and the beating of the water drum. Burchell owed these unrivalled opportunities not only to his

¹ Near Lanyon Vale, many miles above and north-east of Shallow Ford.

² 'Small' added in pencil by Burchell to the amended copy.

³ 'It was to them . . . gratifying to behold a white-man in the midst of their dwellings, unarmed and unprotected, trusting with unbounded confidence to their good faith, showing respect to their prejudices and customs, and, pleased with his new friends, entering, as one of their own tribe, familiarly into their society' (vol. ii. p. 62).

own unique personality and the power of presents, but also to the wise idea of taking with him Bushmen who were known over the track he proposed to pass. These men explained to others of the race that Burchell came with friendly intentions and that he was not one of the dreaded Dutch colonists. At Kaabi's, the largest kraal, Burchell consented to hunt some rhinoceroses which had been seen in the neighbourhood, and Speelman succeeded in shooting two. His excellent account of their habits and the dangers of hunting them is recorded by Burchell.¹ After drawings were made (pp. 46 and 79 of vol. ii.) nearly the whole of the meat was given to the Bushmen. Riizo, although in charge of an outlying kraal by the Gariep, in reality belonged to Kaabi's kraal, and was told by his chief to go on with Burchell until he had seen him safe in the country of the white men—clear evidence of their care for his safety in travelling through their country. The chief of the kraal nearest to Graaff Reinnet also ordered an old man and his son to accompany Burchell, but in this case he was promised that they might carry back a share of any animals shot on the journey. The latter chief and Kaabi each presented a goat prepared for cooking. With these exceptions and the food already mentioned the party depended entirely on their guns and a haartebeest partially devoured by Carnivora. At the halting-place beyond the last kraal it was considered that the journey was half over and the name 'Halfway Spring' was given. It lies on the Brak River, a few miles west of De Aar Junction. Just within the boundary of the Colony the party passed the Table Mountain to the north of Richmond, shown in the woodcut on p. 104, vol. ii. At the foot was a Boer's farm, where they met with a very churlish reception, and as they resumed their journey saw the farmer drive off to report them to the veld-cornet. Here Riizo and the old Bushman left them; but the latter feared to take his son, lest he should be seized as a slave by the Boer, and begged Burchell to take care of him and bring him back. They were very kindly and hospitably received at the two following farms, beyond which an upper reach of the Sea Cow River was crossed and recrossed, and the ascent of the Sneeuwberg begun. On their left lay the lofty Spitskop, 'very unnecessarily,' as Burchell says, 'renamed Compasberg.' A striking little view of the peak as they saw it towering over the intervening mountains is seen in the woodcut on p. 185 (vol. ii.). They crossed the watershed on March 21, 1812, passing a rivulet which Burchell 'considered as the highest source of the *Sunday River*.'² After being again kindly received at a

¹ Vol. ii. pp. 72, 73.

² *Ibid.* p. 125.

farm they travelled on into a mist which grew colder and colder until they could go no further. The Bushboy appeared to be dying of cold, but was revived by a dose of liquor ammoniæ and a fire which they managed to make in spite of the rain. If he had died on their hands it would have been too dangerous for them to return by the same route. Similarly every time Burchell drew a portrait he was incurring great risk ; for if anything had afterwards happened to the sitter it would have been thought that he had been the victim of magic. After a miserable night—the coldest experienced by Burchell throughout his African travels—they descended and reached a warmer level. At the foot of the steep descent they found a ruined hut, where Burchell succumbed (March 23) to an attack of influenza, a malady which, as he afterwards learnt, had just raged in Cape Colony. Dr. F. A. Dixey, who has made a special study of the early epidemics of this illness, has kindly studied Burchell's account of the symptoms, and is satisfied that the illness was the influenza with which we have had a too familiar experience since 1889. While he lay ill in the hut Burchell was visited by three armed burghers, with orders to bring him to the landdrost at Graaff Reinet, 10 miles distant. He of course refused to move ; and before the burghers left, there arrived the surgeon of the 21st Light Dragoons with the son of the late landdrost. They had come thinking that the unknown Englishman might be a survivor from Dr. Cowan's expedition. They told Burchell that the rumours of his approach had for many days thrown the village into alarm, that the guard and night watch had been doubled, and numbers remained under arms in hourly expectation of an attack. '*The current report* was, that three hundred of the Klaarwater Hottentots, under the command of a white-man, were marching to attack the colony, taking advantage of the favorable moment when so many boors were absent from their homes¹ . . . ' fighting the Kaffirs. After other kind visits Burchell felt well enough on the morning of March 25 to drive from 'a spot which,' as he says, 'for some moments during my illness, I thought it possible I might never quit again.'² Mr. Kicherer, the clergyman of the village, for whom Burchell carried letters from the Klaarwater missionaries, took a very different view from that of his correspondents, and wondered at their objections to Burchell opening a road to Graaff Reinet, 'which he considered as an important discovery and highly advantageous for the missionaries themselves.'³

The Bushboy was terrified at the number of strangers and fled, causing further anxiety ; but the eight members of the

¹ Vol. ii. p. 136.

² *L.c.* p. 137.

³ *L.c.* p. 138.

original party arrived in the evening. In a few days the whole of them were seized with influenza, which, however, was only severe in the case of the old man.

The story of this expedition has been treated at some length, because it is probable that the dangers of the unknown country of the Bushmen were much greater than those of any other part of the published journey. Although Burchell's Hottentots were in abject fear at Litakun, the capital of the Bachapins, it is not probable that they were in any danger.

As soon as they recovered from the influenza, Burchell's Hottentots proceeded to turn their shamboks into money and the money into brandy; but even when intoxicated 'they generally exhibited a goodness of disposition which,' Burchell says, he should 'always think, belongs naturally to the Hottentot character.'¹ This, however, was not sufficient protection for the money of old Cobus, which, 'being usually kept in his hat, had been stolen away, while he lay in a state of insensibility, or, as he more delicately called it, sleep.'²

Old Hans and Speelman, who were most eager to help their master in the difficult task of getting men, came into Burchell's room one day to tell him of a Hottentot whom they expected to persuade to join the party. In Burchell's words 'their solicitude for the interest of my journey, and their repeated declaration that they were ready to do anything to serve me, left nothing further for me to wish, but that they were sober.'³

In Burchell's account of his experiences in Graaff Reinet we meet with one of those tantalizing references—and in this case an exciting one—to a later and now missing journal. Old Daniel, or Daniel Kaffir, kept himself as far as possible out of sight during their stay in the village, and it is evident, from the following quotation, that he was an atrocious murderer, who was afraid of being recognized: 'I reserve the horrid story for that part of my journal to which it properly belongs; but I cannot without shuddering, reflect how often my life has been in his hands. . . .'⁴

Burchell soon found that the attainment of the object of his journey was attended with much difficulty at Graaff Reinet, owing to the recent murder of the landdrost by Kaffirs and the extraordinary demand for Hottentot labour created by the war, together with the ordinary great necessities of the farms. Much time was lost in communications between authorities, of whom the commandant on the frontier was chief, and Burchell was compelled to remain over a month, viz. from March 25

¹ Vol. ii. p. 152.

³ *L.c.* p. 152.

² *L.c.* p. 152.

⁴ *L.c.* p. 153.

to April 28. Following Mr. Kicherer's advice, he engaged two Christian half-Hottentots, Cornelis and Jan Van Roye, the latter of whom had been taken to Europe about 1803 as a specimen of missionary conversion. Both had now given way to drink, but it was thought that in the absence of opportunity they would be valuable servants. The landdrost also told Burchell that he had found five Hottentots for him, but others in the village stated that they were all, 'excepting one, known for incorrigible scoundrels, and the refuse of the *tronk* [or jail] *Hottentots*.' ¹ Someone in the village is said to have 'remarked that such men were good enough for the Englishman, as neither he, nor they, would ever return alive.' ² Burchell's people were also often called 'the Englishman's *dood volk* (dead men).' ³ Burchell therefore took advice and selected five other trustworthy 'tronk Hottentots'; for the jail was used as a convenient receptacle for the deserving as well as the worthless. The landdrost replied that all his selections were trustworthy, while the later list contained 'some of the greatest scoundrels in the district.' ⁴ However in the end only one of the latter consented to go, a mixed Hottentot named Jûli, who became the most faithful and valuable of all Burchell's men. Another Hottentot, named Platje, joined the party. He was in the service of a butcher, who made an unsuccessful attempt to detain him. The landdrost similarly made an effort to retain Jûli, because he was a good wagon-driver. The numbers were made up by taking three of the first set of 'tronk Hottentots,' Keyser, Stuurman, and Andries.

On the return journey, begun April 28, Burchell left his former track at the ruined hut, and occupied a few days in making a wide détour to the left or west, thus taking the opportunity of observing another part of the Sneeuwberg. At first he was driven by a kindly and generous Boer in a *paardewagen* with six horses, the pace being far too rapid to suit his powers of observation, and later in an ox-wagon. He regained his old track on May 2, at the nearest point to Spitskop, and a little further on found the whole of his party awaiting him. Here too he was delighted to find his little runaway, the Bushboy, who had been recognized as one of the party by a Boer and kindly cared for until Burchell's return. The party had been increased by several others, but none were permitted to remain except Truij, Jûli's wife, with her baby. She was a genuine Hottentot, who ultimately rendered the utmost assistance, although the record of her faithful service is unfortunately contained in the missing journal. What Burchell thought of her

¹ *L.c.* p. 158.

² *L.c.* p. 159.

³ *Ibid.*

⁴ *L.c.* p. 160.

is sufficiently shown in the following sentence : ' I should do this good creature injustice, if I did not declare that it is not in my power to point out a fault in her character.' ¹

Fifteen sheep which had been generously given to Burchell for the return journey had already been reduced to thirteen. Before proceeding onwards he purchased three horses and a musket of Herholdt, the hospitable Boer at whose house he met his men and stayed the night. His party ' consisted of fifteen men, one woman and her child, four horses, eight oxen, thirteen sheep, nineteen dogs, besides two puppies of an excellent breed.' ² They travelled rapidly, and on May 8 the Bushboy was restored to his father and the whole kraal made happy with tobacco. The next day they encountered a lion, which killed two of their dogs, but moved quietly away when he had received a shot in the side. On May 13 they revisited Kaabi, who had in the meantime moved his kraal several miles northward, and had suddenly come into possession of large herds of cattle—undoubtedly stolen, in Burchell's opinion. They were compelled to camp for the night when travelling towards and within a few miles of Kaabi's kraal, and the Bushmen ' made, upon the heights, three fires at the distance of about sixty yards apart, and forming an equilateral triangle,' ³ a private signal that the party was approaching or that it was friendly and must not be attacked. Nearly the whole of Kaabi's people, including Riizo, came out next morning and conducted them to the kraal, where there was the usual distribution of tobacco, and at night more dancing. Kaabi promised to lend four pack-oxen to take the place of some with backs galled by their loads, but difficulties were now raised by some of the principal people of the kraal. Certain members of Burchell's party were recognized and regarded as spies ; and now that their new position was known the whole kraal had determined to move again on the day following Burchell's departure, and therefore required the oxen for their own use. A vehement dispute between Kaabi and a grey-headed elder finally ended with the loan of only two oxen to Burchell. In the journey north-westward they were visited by the Bushmen of ' Poverty Kraal,' who were made happy with tobacco. On May 19 the party reached the Gariep, at ' Oxford,' just above Riizo's kraal. They were making rafts to cross next day, when information arrived that a much shallower ford, named ' Engelsche Drift,' existed rather higher up. Here a dangerous crossing was effected on the 21st and 22nd.

Important intelligence awaited Burchell on the northern side of the river ; for he now heard of the death of Mulihában,

¹ Vol. ii. p. 181.

² Vol. ii. p. 183.

³ Vol. ii. p. 196.

the chief of the Bachapins, the nation he intended next to visit. At sunset, on May 22, they entered The Kloof village, where old Cobus and Ruiter remained, and the two Groote-doorn Hottentots, with Daniel Kaffir and the Bushman, Nieuw-veld, left for their homes. Burchell reached Klaarwater at 4 P.M. on May 24, and Mr. Anderson coldly received the man for whom he had predicted almost certain death, with 'So you're come back again,'¹ and neither he nor the other missionaries ever asked a question about the journey.

It had been unfortunate for Burchell that Klaarwater was at that time under the control—and, being far outside the Colony, entirely under the control—of narrow-minded men, with no sympathy for the great objects of the scientific explorer. The sort of teaching they imparted is well shown by Juli's question, asked in all seriousness and concern, 'whether it was really sinful to dance, or to play on the fiddle; for, said he, the missionaries tell us that such things are an abomination to God, and that a *fiddle* is Satan's own instrument!' Burchell had himself heard similar opinions from the pulpit at Klaarwater, and he truly remarks, 'If such fanaticism and folly is to be called preaching the Gospel, I much fear that the savages will have reason for thinking, in compassion to our ignorance, that it will be *their* duty to send missionaries among *us*, to lead us out of *our* darkness.'²

Such men as Campbell and the Klaarwater missionaries stand in strong contrast with their successors; for Klaarwater and the Bachapin (Bechuana) nation were destined to receive at no distant date two of the greatest men ever sent out from Great Britain—Moffat and his still more illustrious son-in-law Livingstone.

The oxen now appeared to be in excellent condition, and Burchell hoped to spend no more than a week in Klaarwater; but it was June 6 before he was able to start. Among other annoyances, which seemed inseparable from Klaarwater, a Hottentot, Cupido Kok, to whom Burchell had lent his great 'rifle-gun' for the period of his absence, had taken it on to Litakun. Furthermore gunpowder was valuable at this distance from Cape Town, and Burchell's men 'never reported having missed aim, so often as when we were in the neighbourhood of the Klaarwater Hottentots.'³ The two women were left at Groote-doorn, and the collections and drawings with Mr. Kramer.

Burchell's party collected at Ongeluks Fontein, the second station beyond Klaarwater, consisted of ten Hottentots and one

¹ Vol. ii. p. 223.

² Vol. ii. p. 288.

³ Vol. ii. p. 224.

Bachapin interpreter, named Muchunka, the only man engaged at Klaarwater. Fortunately for Burchell 'he was a man not much wanted, and of no particular importance to the settlement.'¹ They also took about twenty-five dogs of various kinds. On June 16, travelling towards Bloem's Fountain (on the Groen-Water River), Burchell, with intense interest, saw for the first time the footprints of the giraffe. He did not, however, meet the animal itself until October 3, 1812, two months after the date at which his published travels come to an end. A few miles beyond Bloem's Fountain he arrived at Blink-Klip (in Bachapin Sensaván), and examined the workings of an iron ore used by many tribes under the name of sibilo to adorn the body. On June 21, at Kosi Fountain, a little south of the Kuruman Hills, Speelman shot a new species of antelope, described by Burchell as *Antilope taurina*, the Brindled Gnu, or Blue Hartebeest. Four others were obtained in the course of the travels and a skin presented to the British Museum. On June 28 the party entered the pass through the Kamhání Mountains (Kuruman Hills), forming the neutral ground between the Bushmen on the south and the Bachapins on the north.

On entering the territory of this new nation Burchell, with the aid of his interpreter, began to study the language systematically, and some of his main conclusions are given in vol. ii. pp. 296 and 581-585, as also of the language of the Koras on pp. 252-255. It is expressly stated that the whole of Burchell's notes on the language, including a dictionary, could not be included for want of space.² These, therefore, are among the contents of the missing manuscript.

On the great plains south-west of Litakun, at the Makkwarin River, Burchell, on July 6, shot a single specimen out of a crowd of vultures devouring one of his dogs which had died. The contemplation of the bird and its place in the economy of Nature suggested to him very interesting and advanced reflections on the cycle through which organic matter passes. 'Organized matter . . . has been destined to be common property, and to circulate through the whole system of living objects. By this circulation, it passes from one to the other, in increasing support of vitality; proceeding and returning, sometimes in a wider and sometimes in a smaller circle, through an endless succession of periods.' 'Vegetables . . . are the first producers of organization; animals, the destroyers of it. It is evidently the law of Nature, that matter once made capable of life, shall never cease from the same duty; and it is equally so, that animal bodies shall receive no nutriment but from organized substances. From

¹ Vol. ii. pp. 242, 243.

² Vol. ii. pp. 293, 295.

this it follows, that in one body life must cease or be destroyed, before another can obtain that species of food which its conformation renders necessary. . . . Thus we see, throughout the whole system of Nature, all things connected together, and necessary to each other's existence ; useful in life, and useful in death.' ¹

We here see the full recognition of the great antithetical and complementary positions of the plant and animal kingdoms, and can only criticize in the light of modern knowledge the too sweeping statement that 'matter once made capable of life shall *never* cease from the same duty.' Burchell saw plainly the passage of organic substance from plant to animal, and from animal to animal, but he does not seem to be equally clear about the conditions on the other side of the mighty circumference, where matter once made capable of animal life must cease from this duty before it can pass back into the vegetable world.²

On July 9 the only specimen of the Sassaby (*Antelope lunata* of Burchell) obtained on the travels was shot by Juli. It was found on the Great Plains of Litakun at the station on the Makkwarin River (Matlowing River), where they remained several days.

Burchell entered the town of Litakun on July 13. He justly remarks that this people had not yet arrived at that degree of civilization which is marked by permanently fixed abodes, but that they approached it very nearly.³ The want of permanence is particularly well illustrated by the history of the Bachapin capital during the lifetime of a single chief—Mattivi. Mattivi (Mothibi, according to Moffat) was born about 1770 at Nokannin, his father's (Mulihában's) chief town, several days' journey south-west of the site of Kuruman. In 1801 the capital, when visited by a large party from Cape Town, was found at Old Litakun, at a little distance in a north-west direction from the town entered by Burchell. He passed its ruins on September 27, 1812, and they are shown in his map. Owing to a quarrel in consequence of Mulihában taking one of the wives of Makkráki, an important Bachapin chief, another movement of the capital took place in 1802. Makkráki, followed by more than half the inhabitants, went several days' journey to the north-east, while Mulihában established his chief town three days' journey to the south-south-west on the Kuruman River. Before this division Old Litakun was twice the size of the town

¹ Vol. ii. pp. 327, 328.

² Burchell certainly recognized these conditions in part, for he states that most vegetables 'are observed to grow more luxuriantly in earth impregnated with animal juices, or with disorganized animal particles. . . .'—Vol. ii. p. 327.

³ Vol. ii. p. 305.

visited by Burchell. The latter was estimated by him to contain about 5,000 inhabitants,¹ with as many more at outlying cattle-stations. Kuruman Town was visited by Dr. Lichtenstein's party in 1805. Its ruins lay two miles north of Burchell's 'Kuruman Station,' and were passed by him during his later travels on November 16, 1812. The capital only remained on the Kuruman River four years; for in 1806 Mulihában, in consequence of the devastation wrought by a Kaffir raid and from fear of the Hottentot freebooter 'Africaaner,' again moved north to Litakun, which Burchell, in 1812, was the first European to enter. It is not wonderful that, with these successive changes, the plains between Kuruman and Litakun were scored by numbers of footpaths. The move of 1806 was not the last. Mattivi, when trying to induce Burchell to sell him a musket, gave as the reason that he needed it to enable him in the following year to move south to Kuruman with the view of ultimately returning to his father's old capital, where he was born. It was not, however, until June 1817 that the capital was again shifted, and then only to the Kuruman River. The change was due to Mattivi's defeat by the Bakuenas, whom he had raided for cattle. The losses were very large, and he was himself wounded in the foot. Hence in a period of about forty-seven years the site of the Bachapin chief town had been altered at least five times; and in most cases, perhaps in all, the reason seems to have been to escape attack. Burchell says of the nation, 'They are a *timid race* of men. . . . True courage, one may be inclined to believe, is but thinly sprinkled over the land.'²

When Mattivi moved to the Kuruman River, in 1817, the late capital appears to have been utterly abandoned. Campbell³ speaks of the new town on the Kuruman, which he visited in March 1820, as 'Lattakoo,' or 'New Lattakoo.' In the following month he travelled to 'Old Lattakoo'; by this name he did not mean the late capital, but the earlier settlement of Mulihában, the 'ruins of Old Lita(a)kun' of Burchell's map. This Campbell stated to be apparently 'equal in size and population' to Mattivi's town on the Kuruman. Campbell, in April 1820, went to see 'the spot where Lattakoo stood when I first visited it [in 1813], and where the inhabitants of both the present towns were united.' It lay 6 miles to the eastward of Old Lattakoo, and he found that of the crowded capital visited by

¹ Campbell, in the following year, estimated the number of houses in Litakun to be 1500, and the inhabitants 7,500, exclusive of the outposts. *Travels in South Africa*, p. 276, London 1815.

² Vol. ii. p. 558.

³ *Second Journey in South Africa*, vol. i., London 1822.

Burchell in 1812 'not a vestige remained, not one human being was to be seen, nor scarcely any other creature except a few solitary birds and lizards. It was covered with tall mimosa bushes, which in a few years will become trees, and render the place an impenetrable forest.'¹

It is impossible to speak in any detail of Burchell's residence, from July 13 to August 3, 1812, in the chief town of the Bachapins, or of his admirable and precise account of this primitive semi-civilization, as yet unmodified by contact with European nations. These subjects occupy no fewer than 242 pages of the 'Travels,'² or nearly a quarter of the whole work. He gained his experience not only in the period above defined, but also in a second visit of probably nearly a month's duration, as well as during his travels in the surrounding country. We know from the map that this later visit, which is beyond the limits of his published work, was at an end on September 27, 1812.

The enjoyment of Burchell's first visit to Litakun was greatly marred by a prolonged and finally successful attempt made by Mattivi to obtain one of his guns, by the behaviour of some of his Hottentots, at one time rebellious,³ at another cowardly, and by the shameless begging and worrying of the Bachapins. In the great controversy about the gun Burchell, urged to yield by his terrified attendants, was pitted single-handed against Mattivi with his chiefs and people. He resisted with extraordinary courage, resource and ingenuity, but was met with arguments, it must be admitted, equally ingenious, and ultimately had to give way. Among the beggars Mattivi himself was perhaps the most greedy and persistent. Burchell, thinking doubtless of Campbell's exalted language, protests against the use of the word king for such a man, and, for the members of his family, the words queens, princes and princesses. Such language 'would betray a childish vanity which, instead of adding importance to my journal, would only serve to give extremely false notions of the persons whom it means to describe.'⁴ But in spite of the memory of incessant annoyance Burchell kept his sense of humour in speaking of Mattivi. On one occasion, when he had been feasted on dried peaches, softened in water, 'as if prompted by a rising sense of gratitude, Mattivi said he should never come and tease me for tobacco as other people did; but would always wait till I gave him some, of my own accord. This was so handsome a speech, and so becoming the dignity of a monarch, that, with princely liberality, I immediately presented him with a pipe of tobacco.'⁵

¹ *L.c.* pp. 126, 127.

² Vol. ii. pp. 358-599.

³ See footnote 2, *op. cit.* p. 4.

⁴ Vol. ii. p. 368.

⁵ Vol. ii. p. 488.

It is interesting to find that Burchell from time to time spoke to the most serious and intelligent of the chiefs on religious subjects, so that when missionaries settled at Litakun a few years later they came—although probably without knowing it—to a people whose principal men, at any rate, were familiar with the foundations of their teaching.¹

On August 3, 1812, Burchell left Litakun on a hunting expedition, and at this point the great work comes to an abrupt conclusion. The rest of his route, together with the dates of arrival at his stations, up to his return to Cape Town about the middle of April 1815, is clearly shown on the map in the first volume of the '*Travels.*' We thus know that from August 3 to 10 he travelled S.W. from Litakun by a route S.E. of and nearly parallel with the track by which he approached the town. On August 10 he reached 'The Garden,' where he remained probably 16 days, and then retraced his steps, reaching the station within a day's journey of Litakun on August 29.² He appears to have left Litakun for the second and last time on September 27, for this date appears at 'the source of the Moshówa,' a little to the south of the town. During the next three days he travelled in a north-westerly direction, following

¹ The manuscript journal described in footnote 2 on p. 4 shows that Burchell's teaching was far more extensive than a reader would infer from the published *Travels*. Burchell's reticent, sensitive nature led him to make as little as possible of his missionary efforts. He was probably also influenced by dislike and contempt for the missionary teaching of which he had had experience. See p. 29.

² The above statements are confirmed by the recently discovered journal. Burchell remained at 'The Garden' from August 10 to 27. Before starting N. on the last date he sowed in the valley, close by the water, in fine mould, seeds of tamarind, Nankin cotton, cabbages, lettuces, endive, scorzonera, burnet, basil, radish, water melon, scarlet flesh melon, &c., and planted onions and potatoes. He reached the station 'Jabiru Fountain,' within a day's journey of Litakun, on August 29, and this was still his resting-place on September 2, when the journal closes, so that we have no means of knowing the precise date of his re-entry into the capital.

The record of this month—August 3 to September 2, 1812—is deeply interesting, but contains no specially exciting event. Burchell was much harassed by the cowardice of his men, and on August 8, at 'Acacia Fountain,' gave way to despondency. 'I begin to despair of accomplishing scarcely any part of my original plan. . . . Ever since Monday evening a great revolution seems to have taken place in my mind. Till then the thought of returning home never once came seriously into my consideration; but now, worn out by the continual fears of my men, I begin to think I must not return to Litaakun. . . . With dejected spirits and a disappointed mind I seem to view the country as for the last time.' A welcome change in the weather soon restored his spirits, and even for a time put some courage into his men. The record is of especial value in enabling us to understand why Burchell was compelled ultimately to abandon his intention of penetrating much further into the interior than about lat. 26° 2' S. A dangerous accident, which fortunately did not lead to serious results, happened at 'The Garden' on August 12, when Stuurman, one of the Hottentots, was run over by the wagon, fortunately empty, and one of the oxen trod upon him. He recovered very rapidly, after careful treatment and nursing by Burchell.

the course of the Moshówa River. The third day's journey is marked 'very rocky' on the map, and on September 30 he left the river and journeyed nearly north for three days. The names along this route suggest hardship and difficulty from want of water. 'Last Water Station, 1 Oct.,' 'Halt,' 'Desert Station 2 Oct.,' 'An Optical Lake.' Finally, on October 3, he reached 'Giraffe Station,' where he evidently saw this mammal for the first time. 'First Camelopardalis' and '8 Elephants' being marked on the map a little to the north-east of the station. The next day, after a long march due west, he reached 'Chué Lake,' and here remained for over three weeks and achieved his 'furthest north' before turning southward again. It was during this part of his journey, when he was travelling north of Litakun to the Chué Lake, and on his return southward by a route much to the eastward, that Burchell made the greatest zoological discovery of his life. It was, indeed, the greatest in more senses than one, for it was here that he found the largest land animal next to the elephant, the so-called 'White Rhinoceros,' or, as it should be called, 'Burchell's Rhinoceros,' *R. simus*. He described and figured the head and horns of this species in a communication to a French Society.¹ Burchell states, in his communication which was sent to De Blainville, and by him presented to the Society, that for the first time, in the 26th degree of latitude, he met with *R. simus*, inhabiting immense plains, which are arid during most of the year, but every day frequenting the springs, not only to drink but to roll in the mud, which, adhering to the hairless skin, forms a protection against the scorching heat of the sun. Its size he described as nearly double that of *R. bicornis*. The two species, he said, were recognized as very distinct by the negroes and Hottentots, who gave them different names.² The natives told him that *simus* ate only grass, while *bicornis* feeds on branches of trees and bushes, a statement supported by the forms of their respective mouths. He shot ten examples of *R. simus*, and from these obtained the careful measurements published in his memoir.

His wanderings north of Litakun were probably by far the most exciting and interesting part of Burchell's African travels, and it is greatly to be hoped that the missing record of them will be recovered. In the meantime I have come across a brief but charming description of these plains and of a flower that adorns them. It is contained in Burchell's botanical manuscript at

¹ *Bulletin des Sciences par la Société Philomathique de Paris*, June 1817 pp. 96, 97.

² *R. simus* = Mokóhu. *R. bicornis* = Killanyán = Rhenoster.

Kew.¹ Speaking of *Mahernia grandiflora* he says, 'This very elegant and beautiful plant was found in the month of October 1812 in great profusion decorating one particular part of the great sandy plains northward of the town of Litaakun, a country till then untrodden by any European foot. These plains uninhabitable to man from want of water, extend for many days' journies. Their monotonous scenery is occasionally varied with groves of *Acacia giraffæ* whose thin foliage unable to protect these burning sands from the rays of the sun serves only as food for the Giraffe and Elephant. Various plants however in their seasons adorn the ground, amongst which this elegant little Mahernia by its profusion and continued succession of scented flowers of the finest scarlet will not fail to arrest the attention of any traveller let him be ever so insensible to the pleasures that may be derived from the study and contemplation of the productions of Nature.'²

Immediately to the north of the Chué Spring and Lake, Burchell represents the 'Máadji Mountain,' which he ascended on October 9, 1812, and thus reached his northernmost point, very nearly on the same latitude as Maretsani Siding on the railway and as Johannesburg, viz. about 26° 2' S. The track represented on the map shows that he crossed a broad mountain ridge until he nearly reached the top of the northern slope, and thus gained an uninterrupted view of the country he had hoped to traverse. From this point on the mountain a dotted line, stretching north-westward, shows 'the intended track,' passing at first through 'the Karrikarri Country, consisting of immense Plains covered with extensive Forests,' and meant to terminate, as we know from Burchell's published writings, on the west coast. It is probable that Moffat gives the correct reason for Burchell's failure to advance—'he found it impossible to persuade any of his attendants to accompany him. and was therefore obliged to desist.'³ Munaneets, an uncle of Mattivi, was probably referring to Burchell when he told Campbell, in 1813, "that all white persons who had gone beyond

¹ Burchell, *Memoranda Botanica*. MSS. I, p. 75.

² The herbarium record of a specimen of this plant gives the date October 30, 1812, when Burchell was at 'Sand Station. No water' on his return.

³ *Scenes and Labours in South Africa*, London 1842, chap. xiv. See also note 2 on p. 34. It is now certain that Moffat's statement is entirely correct. Among the papers sent to me is Burchell's copy of his letter to 'His Excellency Lord Henry Somerset,' giving a formal account of the journey. It is dated 'Capetown 15 August 1815.' The cause of his return southward on October 27, 1812, is recorded in the following sentence: 'From Litaakun his course was northward and having thence advanced abt. half way to the town of the Kharrikharri was, by the fears and unwillingness of his men to venture farther, constrained to turn towards the Colony.'

Lattakoo had been murdered, except one, who had gone to a place a little beyond them, but had he staid two days longer, he would have been murdered likewise. When we told them their danger,' added Munaneets, 'they would not believe us, they thought it was our covetousness, that we wished to have all their beads.'''¹

Specimens in the Hope Department, Oxford University Museum, also show that Burchell collected butterflies on the Máadji Mountain on October 22, while on the same day he captured two specimens of *Teracolus subfasciatus*² at the Chué Spring. From these and one or two other examples of the same species Swainson not only described the species, but founded the important genus *Teracolus*.

Burchell turned back in a south-westward direction, evidently on October 27, inasmuch as this is the date of arrival at 'Terminalia Station,' and no halting-place is indicated between it and the Chué Spring. The names of stations suggest difficulty on the return no less than on the outward journey. Thus a long day's journey brought him to the Moshówa river on October 28, but the name of his resting-place is 'Hot Station.' He started again on the 30th, and after a very long day, with one halt indicated, he reached 'Sand Station. *No water.*' The next day, however, he reached 'Kuru, or the Wells,' only a little north, but far west of Litakun. From this point, keeping south-eastward, he only stopped at stations on the Kuruman River or its tributaries, until on November 17, he rejoined his track of June 28 at one of the sources of this stream. His observations of the Bechuana peoples on this journey, especially at Patáni, where he stayed a week, would be of the deepest interest could they be recovered. Burchell remained over a month at the sources of the Kuruman River, and vigorously hunted insects of many orders, as may be conspicuously seen in his collection. On November 25 he paid a visit to 'The Garden' from the south, as I find from the data on a butterfly. The same kind of information proves that he retraversed the defile in the Kámhanni mountains, and finally quitted the Bachapin country on December 20. Burchell leisurely retraced his former steps, collecting as he went, to Klaarwater, which he reached on January 4, 1813. Here he remained a fortnight, and on January 18 left it for the last time. It is unnecessary to recount the details of the remainder of his journey. Burchell

¹ Campbell's *Trave's*, 1815, p. 263.

² The specimens were a male and female. The latter certainly exists in the Burchell collection at Oxford, while a fragmentary male of this species in the same collection is probably the second specimen captured on October 22, 1812.

reached Graaff Reinet on March 31, 1813, travelling south-east from Klaarwater by a route north-east of his former track, and lying for a considerable distance along the south bank of the Orange River. He crossed the northern boundary of the Colony at Plettenberg's Baaken, to the north of Naauw Poort.

At this point, where Burchell re-entered the Colony, never to leave it again until the day when he sailed from Africa, it is of interest to compare the relative dangers of the routes which he had pursued outside its boundaries. For many years before Burchell's journey we find that the main practicable route for the explorer from the south lay well to the west of the Orange River Colony and the Transvaal, and even of the line of the present railway. The track to Klaarwater and on to Litakun represented a line of least resistance through the untamed and untamable Bushmen tribes, and once within these spheres of influence the dangers were comparatively small. Burchell undoubtedly ran by far the greatest risks of any in his long African journey when, in 1812, he travelled to Graaff Reinet and back to Klaarwater, and when, early in the following year, he pursued his more easterly route to the former place. But the causes which led Lichtenstein and Burchell to penetrate Africa by way of the Bechuana races also operated to make any further progress difficult, or even impossible. The nation at the northern head of the trade route, fearful of losing its lucrative monopoly, always strove to prevent the traveller from advancing any further into the interior and trading with the tribes beyond. Even thirty years later Livingstone, pressing northward by the same track, encountered well-nigh insuperable difficulty from this very cause on the way to Lake N'Gami and the Zambesi.

Burchell remained in Graaff Reinet from March 31 to May 12, 1813. Here on April 31 he met the missionary Campbell, who was journeying to Klaarwater, and advised him to travel by way of the Brak River (Burchell's earlier route), and to guard his cattle from the Bushmen with the utmost care.¹

From Graaff Reinet Burchell travelled south-eastward towards the mouth of the Great Fish River, which he visited on September 22, 1813. In the course of this part of his journey he passed along the line of military posts established on the west side of the Great Fish River, in order to repel Kaffir raids; and he remained over a month (August 4 to September 9, 1813) at Grahamstown. At this time and during the eastern section of the return journey to Cape Town along the south coast Burchell made the observations which were the basis of his advice to the Parliamentary Committee in 1819, and of his

¹ *Travels in South Africa*, by John Campbell, pp. 170, 171, London 1815.

pamphlet 'Hints on Emigration to the Cape of Good Hope' (see p. 19).

The mouth of the Great Fish River is the south-eastern angle of the great triangle formed by Burchell's route, Cape Town being the south-western angle, Klaarwater the northern, and the journey into British Bechuanaland an extension directly northward from the last-named angle or apex.

Here at the easternmost point of his travels Burchell's wanderings were complicated and rather difficult to follow on his map; but it is clear that he started, from 'Lombards', on October 25, 1813, to begin the southern side or base of the triangle. Proceeding in his leisurely fashion, observing, recording, collecting, drawing, and there is no doubt writing a journal which would be of priceless scientific value could it be happily recovered, Burchell reached Cape Town about the middle of April 1815, occupying almost exactly eighteen months over this part of his journey. At intervals he touched the shore, travelling round Cape Recife, visiting the 'landing places' at the western sides of Plettenberg's Bay and of Mossel Bay. He made long pauses at places which appealed most to his interest as a naturalist, such as Uitenhage, which he visited more than once, 'Melkhout [Milk-wood] Kraal,' near Knysna, 'Sylvan Station,' on the southern slopes of the Postberg, north-east of George, and 'Mountain Station,' to the north of St. Sebastian Bay.¹

Burchell probably remained in Cape Town for over four months. The exact date of his departure is unknown, but the data on insects in his collection show that on September 16, 1815, he was in St. Helena, on the homeward voyage.

Burchell lived for nearly fifty years after his return from South Africa, but it is obvious that any full description of his work would be inappropriate on this occasion. Some slight account is, however, necessary in order to complete the sketch of this great man.

The ten years between the return from Africa and the start for Brazil must have been chiefly occupied with the arrangement of his collections, and writing and illustrating his great work.² He sowed large numbers of the seeds and planted

¹ With the kind help of my friend Mr. Guy A. K. Marshall all the data given in Burchell's African Catalogue of Insects have been copied and sorted in order of date, so that the whole of the captures on each day at each locality can now be seen. It is hoped that this will be published at no distant date, together with all the information that can be gained from Burchell's map, the whole making a naturalist's itinerary for the entire journey, with records of the insect captures.

² The original journal, already described (see footnote 2 on p. 4), contains abundant pencil marks in its margins and pencil parentheses in the written

numbers of bulbs brought with him from Africa. The results, with the fullest data, he recorded in special note-books now preserved in the Herbarium Library at Kew. One result serves as a model of patient observation. He obtained bulbs of *Amaryllis riparia* at 'Amaryllis Station,' by the south bank of the Orange River, on February 17, 1813. These he planted at Fulham after his return, and they flowered in 1817, 1818, 1820 and 1821. On August 3, 1818, he notes that they 'ripened very fine bulbous seed,' which was sown with the following results: 'The seed of *Amaryllis riparia* sown in 1818 did not flower (at Fulham) till June 1854.'¹ Watch had to be kept for thirty-six years before a flower from the English-grown seed could be recorded!

Not only did Burchell write his classical work, but nearly everything that he gave to the world in his whole life was written and published in those ten years—his 'Hints on Emigration to the Cape of Good Hope,'² his description of *Rhinoceros simus*,³ his List of the Skins of 143 Quadrupeds presented to the British Museum, September 30, 1817.⁴ It was the

page. These indicate the material worked up by the author into the smooth, continuous narrative of the *Travels*. But the same markings are continued beyond the date at which the published work closes, to the very end of the journal. This strongly suggests that Burchell prepared the manuscript for a much longer work, perhaps indeed for the whole of his African journey.

Much of his time was also probably occupied with drawing independently of the illustrations required for his volumes. Thus a wonderfully detailed painting, 'Inside of my African Waggon,' was exhibited as No. 868 at the Royal Academy in 1820. The picture, which has been kindly lent to me by Mr. Francis A. Burchell, is a remarkable piece of still life. It measures only 1 foot 7 inches by 1 foot 1½ inch, yet into that space the painter has introduced everything characteristic of his life so far as it was spent within the wagon, and typical of the collections he made. Among the papers kindly shown me by the Rev. Evan Davies was a long slip which gave full details of the time occupied in the work:—

'The Drawing of the Inside of the Waggon was finished in the following order:—

Tortoise	}	12/2/20.
Elephant's grinder		
Hippopotamus tusk		
Press Screws	}	14/2/20.'
Memorandum Book		
Flute		
Shell	}	27 "

Then follows a long list of further details, ending with these words:—

'Finished the retouching	3 and 4/4/20.
Put a few finishing touches. Worked at this drawing—In sketching	4 days.
In colouring	27 "
	31 "

or about 120 hours' work on the whole.'

¹ Burchell, *Memoranda Botanica*, MSS. I, Part III.; Catalogue of Bulbous Roots brought from South Africa: No. 36.

² London, August 1819.

³ Paris, 1817.

⁴ London, Spottiswoode, n.d.

neglect of some of these skins which occasioned the quarrel with that institution, already referred to.¹

Burchell's Catalogue of South African Insects, now at Oxford, is a model of careful work, and must have consumed a great deal of his time. It involved the transport of many hundreds of specimens, a few at a time, to the Linnean Society for comparison with the Banksian collection. Although insufficiently dated, it is certain that the whole of this work was accomplished between 1815 and 1825. Finally there was the preparation for his Brazilian journey, itself a very considerable undertaking, requiring much time and thought.

Burchell started for his five years' journey and work in the New World on March 10, 1825. He sailed from Portsmouth, spent two months collecting near Lisbon, a day in Madeira, two days in Tenerife, and landed at Rio de Janeiro on July 18, 1825.

We learn from a letter² written by Burchell to his friend Sir William Hooker the main lines of his work at Rio: 'I continued making collections in botany, entomology and geology, &c., till September 1826, during which period I visited a part of Minas Geraës. While at Rio I made some drawings of landscape, among which was a panorama taken from a hill in the middle of the city; many astronomical, philosophical and geodetical observations.' The excursion into Minas Geraës occupied more than a month, while another of just under a month was made into the Organ Mountains.

Among the records of Burchell's residence at Rio are one or two which give us a glimpse into the nature of the man himself. Although he came to work—and indeed worked probably harder than any other traveller—we find that he spared time to make a drawing³ of his friend Mrs. Esther Fry and her two children on the shore. Mrs. Fry also painted Burchell as one of a party at her house. He is seen from behind, holding his flute in his hand. But we are admitted into closer intimacy with this mysterious personality in the following charming passage written by Mrs. Fry in her husband's diary:—

'September 8 [1826]. Edward being gone to Mr. March's estate in the mountains, I [Mrs. Esther Fry] am become the

¹ See p. 18; also *Travels*, vol. i. p. 383, &c.; vol. ii. p. 336, &c.

² This letter, now preserved at Kew, is dated November 1, 1830, from Churchfield House, Fulham. Much of it is published in Hooker's *Botanical Miscellany*, vol. ii. 1831, pp. 128-133.

³ Now in the possession of Mrs. Miers, one of the children represented in the picture. I owe the opportunity of reproducing the passage to her son, my friend, Professor H. A. Miers, F.R.S. I recognized the sketch for this painting in the fine collection of Burchell drawings in the possession of the Rev. Evan Davies, of Springs. Mr. Davies very kindly allowed me to examine the whole collection during the visit of the British Association to Johannesburg.

journalist. Astonished at the sound of a horse's feet chiming into the hall while at dinner, which sent little and big to the top of the stairs, screaming out "Papa," "Papa," but were all hurried back by the appearance of a gentleman ascending the stairs muffled in an enormous cloak, which on unwrapping produced, to my amazement, the vision of Mr. Burchell, whom I supposed many miles outside the harbour! He had a day's furlough, and determined on dining with us. Fortunately my meal had been delayed by Mr. and Mrs. Kielchen [?] calling just as it came on table, or poor Mr. B. would have run the risk of dining with Duke Humphrey; as it was he sat down at Alleck's side and made a hearty dinner; then left to pay some more adieux at Botafogo, and returned to tea with me. Pleasant conversation, as usual, with him, and at eight o'clock he went, having to be on board the 'Aurora' by sunrise tomorrow. Fine and cloudy. Therm. 69°.

Burchell's manuscript in the Hope Department at Oxford shows that he was not able to sail until Sept. 10, and that on Sept. 12 he landed at Santos to begin, on Dec. 3, his great three-years' journey northward through the heart of Eastern Brazil to Pará. The main incidents and lines of work pursued in these travels are best made known in the picturesque language of the letter to his friend, from which I have already quoted (p. 41). 'At Santos,' he wrote, 'I remained three months, and then proceeded and took up my station in a solitary hut in the midst of forests at the foot of the great range of mountains [Sierra da Cubatão], for the purpose of exploring them at leisure. My next station or headquarters was at the city of S. Paulo,¹ nearly under the tropic of Capricorn, where I remained about seven months, extending my excursions in various directions. Having there purchased a troop of mules and engaged the requisite muleteers, I travelled northward, and finally took up my station at the city of Goyaz, being the first and only Englishman who has entered that province. There I passed the rainy season of 1827, and made large collections, being detained there nine months owing chiefly to the difficulty of finding the means of conveyance for my baggage. At length resuming the road, and still continuing northward, I reached, in November 1828, Porto-Real, on the great river Tucantins. Here I remained till the proper season for embarking, and, descending the

¹ Here Burchell discovered that η Argús was a grand example of a variable star. 'In 1827 the traveller Burchell, being then at St. Paul, near Rio Janeiro, remarked that it [η Argús] had unexpectedly assumed the first rank—a circumstance the more surprising to him because he had frequently, when in Africa during the years 1811 to 1815, noted it as of only fourth magnitude.'—*History of Astronomy during the Nineteenth Century*, by Agnes M. Clerke, pp. 58–59.

stream, at all times rendered dangerous by numerous rocky falls, rapids and whirlpools, I made considerable collections on ground over which no scientific traveller had ever passed. I completed a survey of the whole length of this voyage, fixed by numerous astronomical observations. Finally, I arrived at the city of Para in June 1829, and, while waiting till February for a convenient opportunity of embarking for England, added largely to my collections both in zoology and botany. Of this city I made a panorama, which, with that of Rio, I hope perhaps to succeed in getting engraved,¹ together with my landscapes, &c. Of insects I found from sixteen to twenty thousand specimens (at a guess). Of birds I shot and preserved 362 species. In the other classes a proportionately smaller number. I am not aware of any part of my collections being lost, though I daily lament my inability to unpack them, for want of room in the house.'

This was a fine journey, undertaken with Burchell's splendid deliberation, enabling him to observe, collect and record over a most interesting route then unknown to science, and now very imperfectly known. He had, however, a far more ambitious scheme in his mind, which he confided to his friend Sir William Hooker, in a letter written from Rio.² Two years later, writing to the same friend from Goyaz, he explained that the state of his father's health made it necessary for him to return to Europe by a much shorter and more direct road.³ Both letters are preserved at Kew.

Burchell left Pará on February 10, 1830, arriving at Dover on March 24, and reaching his home in Fulham on the following day. It is deeply to be regretted that his Brazilian journal has

¹ It is stated by H. Manners Chichester in *Diet. Nat. Biog.*, vol. vii., London, 1866, pp. 290-291, that Robert Burford, of Leicester Square, executed a panorama of Rio from Burchell's paintings.

² 'It is at least my *wish* to visit the city of St. Paulo; and thence by land through the provinces of Goyaz, Cuyaba, and Matto Grosso into Peru, having the city of Luzco as my principal object; and after doing in Peru as much as my time (for my family prefer my being in England) and slender means will allow me to do, I should wish to proceed by land to Arequipa, Potosí, Salta, &c. &c., to Buenos Ayres, and thence to my home at Fulham. . . . '—Rio, July 8, 1826.

³ ' . . . I have kept my original plan always in view, and had advanced thus far on my way to Peru, &c., when letters from Fulham overtook me, stating that my dear father's health, from the infirmities natural to his age, was gradually declining, and that it was his wish and that of the rest of the family that I should return directly to England. Whatever regret I may feel at thus relinquishing my American travels, and whatever disappointment I may experience from a premature return, I have no hesitation whatever in preferring filial duty to science and the gratification of my own inclinations. I have therefore greatly altered my plans, and instead of ending this journey at Buenos Ayres shall. *Deo volente*, end it at Pará, where I shall embark for England.'—Goyaz, April 25, 1828.

never been discovered. We know that it existed, not only from his letters to Sir William Hooker, but from numerous incidental statements in Burchell's note-books on Brazilian natural history. From this source I find that he had a native attendant named 'Congo,' who seems to have been as good a naturalist in Brazil as 'Speelman' was in South Africa.¹ His exact route in Brazil is fortunately preserved in connexion with the plants at Kew and the insects at Oxford.

Burchell's collections in the New World were many times as large as those which he made in the Old, and their arrangement, manipulation and careful re-labelling occupied the remaining years of his life.

A few years after his return from Brazil Burchell received the degree of D.C.L. *Honoris Causa* from the University of Oxford. Daubeny, the Professor of Botany, had delivered his inaugural lecture on May 1, 1834, and gave the first of his course of lectures on Vegetable Physiology on May 8, the very day when Burchell received the degree.² It seems probable

¹ Numerous letters written to members of his family by Burchell from Brazil have just reached me, kindly lent by Mr. Francis A. Burchell. Although there has not been time to examine them carefully, I see at once that they will be of the utmost service in reconstructing the story of the Brazilian journey. Others in like manner will enable us to recover some of the missing African narrative. In one letter, written from Pará shortly before he sailed, Burchell expresses the intention of bringing his native 'boy' home with him. It would be very interesting to know if this intention was carried out, and to learn the history of 'Congo' in this country.

² The words of the University Notice run:—

'A Convocation will be holden on Thursday next, the 8th instant, at two o'clock, in which it will be proposed to confer the Honorary Degree of D.C.L. on William John Burchell, Esq., of Fulham, in the County of Middlesex.

'G. ROWLEY,

'Delegates' Room,

'Vice-Chancellor.

'May 5, 1834.'

Since the above sentences were written I have had the opportunity of reading Burchell's correspondence, kindly lent to me by Mr. Francis A. Burchell, and I find that the great naturalist was received as an honoured guest at Oxford, and had many friends there. He wrote to his sister Mary from Oxford on June 19, 1832, 'I dined with the Duncans in New College and attended some scientific meetings in the evening. Have met many persons I know, and am likely to pass a pleasant time here. . . . To-day I dine with the scientific men, a very large party. I met Hansell, who was pleased at seeing me. I breakfasted this morning in Lincoln College, and to-morrow with a large party at the Vice-Chancellor's, and dine at Dr. Kidd's.' It was evidently Commemoration time, and Burchell says 'there is scarcely a bed to be got.' Again, on February 14, 1835, the year after his degree, he wrote to his mother and two sisters, 'On my arrival I found, through Mr. Duncan, that the Warden of New College (Dr. Shuttleworth) expected I should accept a bed at his house, and here I have therefore taken up my quarters. I have met everywhere with the same kind and flattering reception as on former occasions. . . . I am engaged for all the rest of my stay here. To-morrow dine with Dr. Kidd, Monday breakfast with Dr. Buckland and dine with Duncan. Tuesday breakfast with Hansell and dine with Dr. Macbride.'

that Burchell came to Oxford to be present at the lecture, and that the occasion was chosen for the conferment of the honour.

Burchell greatly appreciated this distinction. Miss Anna Burchell,¹ in presenting her brother's zoological collections to the University of Oxford, wrote in 1865 that she was acting 'in accordance with what I believe to have been his wish'; while Professor Westwood² definitely stated that the collections were presented 'in recognition of the honour conferred on her brother by the degree of D.C.L. . . .'

Apart from this one well-deserved distinction Burchell received but little credit for his great work. The munificence of the wealthy patron of learning had been replaced in Burchell's day by a system of Government patronage, taking the practical form of pensions. The fact that Burchell did not receive the recognition accorded to far less distinguished men was a keen disappointment to him. Bitter resentment on behalf of his neglected friend breathes in William Swainson's dedication.³

TO

WILLIAM JOHN BURCHELL, Esq.,
The African Traveller,

Whose discoveries have benefited every branch of natural science; whose knowledge is equal to their full elucidation; and whose talents—unfostered by, and unknown to, his own Government,—are held in respect and estimation throughout the civilized world, this third volume of '*Zoological Illustrations*' is dedicated by his attached and affectionate friend, the Author.

A few years later Swainson published, among the biographies of other naturalists, an account of Burchell's labours. Almost the whole of the article⁴ is occupied by a statement of the grievance against the Government.

¹ *Ann. and Mag. Nat. Hist.*, 1904, January, p. 56.

² *Ibid.* 1904, April, p. 307, where the original statement is reprinted. It is to be found in the rare publication, *Proceedings of the Ashmolean Society*, Oxford, new series, No. 1, November 26, 1866.

³ *Zoological Illustrations*, vol. iii., second series, 1832-33.

⁴ The biography of W. J. Burchell is brief, and it may be a convenience to quote the whole of it: 'One of the most learned and accomplished travellers of any age or country,—whether we regard the extent of his acquirements in every branch of physical science, or the range of the countries he has explored. Science will ever regret that one whose powers of mind are so varied, and so universally acknowledged throughout Europe, should have been so signally neglected by his Government—the most thankless and ungrateful one, to unpatronised talent, under Heaven. Having expended large sums in prosecuting his travels in Southern Africa, and bringing home immense collections, astronomical observations, &c., the Prussian Government offered him a handsome pension if he would carry all to Berlin, and settle in that city. This he refused, under the vain hope of publishing his discoveries in his own country. Disappointed in this, he again set off for Tropical America, where he travelled for

Swainson's statements are in some respects exaggerated—especially so with the period assigned to the Brazilian travels—and they have produced the erroneous impression that Burchell's Brazilian specimens were never unpacked. Burchell's own note-books at Kew and Oxford show the exact dates at which nearly everything was examined, the plants remounted and re-labelled and the insects set out. It is quite true, as Sir William Hooker more than once pointed out to his friend, that much of this mechanical work could have been greatly lightened by skilled assistance, which, however, Burchell could not afford to obtain.¹ But it is more than doubtful whether so individual and exact a worker could have endured to leave any of the details to another, and it is quite certain that the work would not have been done so well or so carefully by any other hand.

Although the Government did nothing for one of the greatest men of the time, the botanist Richard Anthony Salisbury, himself a very remarkable man insufficiently appreciated, made Burchell his executor and residuary legatee.² The will was:

nearly seven years. The fruits of all these labours, however, lie hid in unopened packages, and may probably never see the light until the death of their possessor. A Government which bestows honours upon writers of novels, and pensions for licentious ballads, cannot be expected to regard modest worth or unobtrusive talent.—From the *Cabinet Cyclopædia* of Dionysius Lardner, vol. on 'Taxidermy, Bibliography and Biography,' by Wm. Swainson, London 1840, Appendix, p. 383.

¹ 'After the consumption of so much of my property by my travels and the disinterested pursuit of science all the rest of my life, the obtaining of assistance by payment is quite out of the question.'—Letter to Sir William Hooker, June 25, 1835.

² The character of Salisbury is partially revealed by his will, probate of which has been kindly lent to me by Mr. Francis A. Burchell: 'I desire to be buried in the plainest manner possible in the nearest Church Yard to where I die with nothing black about me in a plain Oak Coffin and instead of the usual expense of an undertaker £50 given to the poor of the Parish.' The words referring to Burchell are as follows: 'I leave all the rest of my property Books Plate Furniture linen Money on bond or in Russian Stocks to William John Burchell Esq. of Fulham now daily expected home from Brazil making him my Sole EXECUTOR & residuary Legatee of this my last Will hereby revoking all former Wills at any time herebefore made by me and if I should die before he returns I wish his oldest sister Miss Burchell to take possession of every thing belonging to me till he arrives.' The document was undated, but it was sworn 'that the Testator died on the 23rd or 24th of March 1829,' and it is probable, from the words referring to Burchell's expected return, that the will was made shortly before the testator's death. The expectation was curiously out of accord with the actual facts, for Burchell at the time of Salisbury's death was at Porto Real (now Porto Nacional) on the Tocantins. He had neither begun his descent line from Santos to Pará. The discrepancy is to be explained as follows: Burchell's father died on July 12, 1828, and the family, thinking that Burchell had received their communications, expected him home within a few months. They were unaware of the difficulties of travelling and of transmitting correspondence into the heart of Eastern Brazil. One of the letters so kindly lent me proves that Burchell was unaware of his father's death until October 15, 1829, four months after his arrival at Pará on June 10.

sworn for under £10,000, and, as sums amounting to £3,450 were bequeathed, it is probable that Burchell received over £6,000.

I now propose, by a few examples, to show the extraordinary powers of observation possessed by Burchell. They are selected from the data on the specimens in his African and Brazilian collections of insects at Oxford, and from the unpublished manuscripts referring to them.

One of the most interesting and arresting of biological problems during the last half-century has been the attempt to explain those remarkable superficial resemblances between organisms, chiefly insects, to which the misleading term 'mimicry' has been applied. The interpretations offered by H. W. Bates in 1862¹ and by Fritz Müller in 1879² have so stimulated the interest of observers that new examples have been continually discovered, and the material at the disposal of the naturalist has been multiplied a hundredfold. The contemplation of the luxuriant insect life of Brazil supplied the intellectual material out of which the two great naturalists named above built the hypotheses which will ever be associated with their names. Work in the tropics of the New World was followed by the splendid investigations of A. R. Wallace³ in the Oriental Region; while later research, led by the great monograph of Roland Trimen,⁴ has been chiefly concentrated in Africa, and especially South Africa. Only so recently as 1902 the subject was greatly enriched by the publication of five years' observations in Rhodesia and Natal by Guy A. K. Marshall.⁵ The most wonderful mimetic association described by him is composed of flower-haunting beetles belonging to the family *Lycidæ*, and the heterogeneous group of varied insects which mimic their conspicuous and simple scheme of colouring. The Lycid beetles, forming the centre or 'models' of the whole company, are orange-brown in front for about two-thirds of the exposed surface, black behind for the remaining third. They are undoubtedly protected by qualities which make them excessively unpalatable to the bulk of insect-eating animals. Experimental proofs of their distasteful qualities have been obtained by the author. What are the forms which surround them?

¹ *Trans. Linn. Soc. Lond.*, vol. xxiii. 1862, p. 495.

² *Kosmos*, May 1879; translated by R. Meldola, F.R.S., in *Proc. Ent. Soc. Lond.* 1879, p. xx.

³ *Trans. Linn. Soc. Lond.*, vol. xxv. 1866, p. 1; the memoir occupies the whole of Part I., published separately in 1865.

⁴ *Trans. Linn. Soc. Lond.*, vol. xxvi. 1870, p. 497; the memoir was the first in Part III., published separately in 1869.

⁵ *Trans. Ent. Soc. Lond.*, 1902, p. 287.

According to the hypothesis of Bates they would be, at any rate, mainly palatable hard-pressed insects which only hold their own in the struggle for life by a fraudulent imitation of the trade-mark of the successful and powerful *Lycidæ*. According to Fritz Müller's hypothesis we should expect that the mimickers would be highly protected successful and abundant species which (metaphorically speaking) have found it to their advantage to possess an advertisement, a danger-signal, in common with each other, and in common with the beetles in the centre of the group. According to the first view the mimic is a danger to its model, according to the second it is a benefit. If A, B, C, D, &c., are all unpalatable and all recognized by the same appearance, and if their enemies have to learn by experience what to eat and what to reject, it follows that when A is tasted and found unpleasant, B, C, D, &c., are benefited. They would be tasted more cautiously, or perhaps abandoned without tasting. On the next occasion B would be tasted by some other inexperienced foe, and the advantage would lie with A as well as C, D, &c. It is hardly necessary to explain that under either hypothesis volition has nothing to do with the growth of resemblance, but that it is believed to be brought about by the survival in successive generations of those individuals most like the model or most like one another. The death of individual A or B as a result of the tasting is no difficulty. Far more individuals of A, B, C, D, &c., would be killed by experimental tasting if they had different patterns than if they had the same, and this is advantage enough to cause a strong trend in the direction of resemblance.

How far does the constitution of this wonderful group—the largest and most complicated as yet known in all the world—convey to us the idea of mimicry working along the lines supposed by Bates or those suggested by Müller? Figures 1 to 52 of Mr. Marshall's coloured plate¹ represent a group of thirty-nine or forty species of insects captured in Mashonaland, and all except two in the neighbourhood of Salisbury. The group includes six species of *Lycidæ*, nine beetles of five groups all specially protected by nauseous qualities, *Telephoridæ*, *Melyridæ*, *Phytophaga*, *Lagriidæ*, *Cantharidæ*, five Longicorn beetles, eight stinging Hymenoptera, three or four parasitic Hymenoptera (*Braconidæ*, a group much mimicked and shown by some experiments to be distasteful), five bugs (Hemiptera, another unpalatable group) two moths (*Arctiidæ* and *Zyggænidæ*, distasteful families), one fly. In fact the whole group of thirty-nine or forty species, except perhaps one Phytophagous and the Longicorn

¹ *Trans. Ent. Soc. Lond.*, 1902, Plate XVIII.; see also p. 517, where the group is analysed.

beetles and the fly, fall under the hypothesis of Müller and not under that of Bates. And it is very doubtful whether these exceptions will be sustained; indeed, the suspicion of unpalatability already besets the Longicorns, and is always on the heels—I should say the hind tarsi—of a Phytophagous beetle. This most remarkable group, which illustrates so well the problem of mimicry and the alternative hypotheses proposed for its solution, was, as I have said, first described in 1902. Among the most perfect of the mimetic resemblances in it is that between the Longicorn beetle, *Amphidesmus analis*, and the *Lycidæ*. It was with the utmost astonishment and pleasure that I found this very resemblance had almost certainly been observed by Burchell. A specimen of the *Amphidesmus* exists in his collection, and is numbered '651.' Turning to the same number in the African Catalogue we find that the beetle is correctly placed among the Longicorns, that it was captured at Uitenhage on November 18, 1813, and that it was found associated with Lycid beetles in flowers ('consocians cum Lycis 78-87 in floribus'). Looking up Nos. 78-87 in the collection and catalogue, three species of *Lycidæ* are found, all captured on November 18, 1813, at Uitenhage. Burchell recognized the wide difference in affinity, shown by the distance between the respective numbers; for his catalogue is arranged to represent relationships. He observed, what students of mimicry are only just beginning to note and record, the coincidence between model and mimic in time and space and in habits. We are justified in concluding that he observed the close superficial likeness, although he does not in this case expressly allude to it. In many other instances, however, he does speak of it, as will be seen below.

Conspicuous among well-defended insects are the dark steely or iridescent greenish-blue Fossorial Wasps or sand-wasps, *Sphex* and its allied genera. Many Longicorn beetles mimic these in colour, slender shape of body and limbs, rapid movements and the readiness with which they take to flight. On December 21, 1812, Burchell captured one such beetle (*Promeces viridis*) at Kosi Fountain, on the journey from the source of the Kuruman River to Klaarwater. It is correctly placed among the Longicorns in his catalogue, but opposite to its number is the comment, '*Sphex! totus purpureus.*'

In our own country the black and yellow colouring of many stinging insects, especially the ordinary wasps, affords perhaps the commonest model of mimicry. It is reproduced with more or less accuracy on moths, flies and beetles. Among the latter it is again a Longicorn which offers one of the best known,

although by no means one of the most perfect, examples. The appearance of the well-known 'wasp-beetle' (*Clytus arietis*) in the living state is sufficiently suggestive to prevent the great majority of people from touching it. The dead specimen is less convincing, and when I showed a painting of it to Dr. Alfred Russel Wallace in 1889 he doubted whether it was an example of mimicry at all. I replied that he would not question the interpretation if he had noticed the beetle in life; and he at once recalled the movements of allied forms in the Eastern Archipelago, and admitted the mimetic resemblance. In fact, the slender, wasp-like legs of the beetle are moved in a rapid, somewhat jerky manner, very different from the usual stolid coleopterous stride, but remarkably like the active movements of a wasp, which always seem to imply the perfection of training.¹ In Burchell's Brazilian collection there is a nearly allied species (*Neoclytus curvatus*) which appears to be somewhat less wasp-like than the British beetle. The specimen bears the number 1188, and the date March 27, 1827, when Burchell was collecting in the neighbourhood of S. Paulo. Turning to the corresponding number in the Brazilian note-book we find the following record: 'It runs rapidly like an ichneumon or wasp, of which it has the appearance.'

The formidable, well-defended ants are almost as much mimicked by other insects as the sand-wasps, ordinary wasps and bees. Thus on February 17, 1901, Guy A. K. Marshall captured, near Salisbury, Mashonaland, three similar species of ants (Hymenoptera) with a bug (Hemiptera) and a Locustid (Orthoptera), the two latter mimicking the former. All the insects, seven in number, were caught on a single plant, a small bushy vetch.²

This is an interesting recent example from South Africa, and large numbers of others might be added—the observations of many naturalists in many lands; but nearly all since the date of the two great hypotheses which directed general attention to the subject. We find, however, that Burchell has more than once recorded it. An extremely ant-like bug (the larva of a species of *Alydus*) in his Brazilian collection is labelled '1141,' with the date December 8, 1826, when Burchell was at the Rio das Pedras, Cubatão, near Santos. In the note-book the record is as follows: '1141 *Cimex*. I collected this for a Formica.'

Some of the chief mimics of ants are the active little hunting spiders belonging to the family *Attidæ*. Examples have been brought forward during many recent years, especially by

¹ Poulton. *Colours of Animals*, 1890, pp. 249, 250.

² *Trans. Ent. Soc. Lond.*, 1902, p. 535. Plate XIX. figs. 53–59.

my friends Dr. and Mrs. Peckham, of Milwaukee, the great authorities on this group of Arachnids. Here too we find an observation of the mimetic resemblance recorded by Burchell, and one which adds in the most interesting manner to our knowledge of the subject. A fragment, all that is now left, of an *Attid* spider, captured on June 30, 1828, at Goyaz, Brazil, bears the note, in this case on the specimen and not in the note-book, 'Black . . . runs and seems like an ant with large extended jaws.' My friend Mr. R. I. Pocock, to whom I have submitted the specimen, tells me that it is not one of the group of species hitherto regarded as ant-like, and he adds, 'It is most interesting that Burchell should have noticed the resemblance to an ant in its movements. This suggests that the perfect imitation in shape, as well as in movement, seen in many species was started in forms of an appropriate size and colour by the mimicry of movement alone.' Up to the present time Burchell is the only naturalist who has observed an example which still exhibits this ancestral stage in the evolution of mimetic likeness.

A scientific explanation of these resemblances was, of course, impossible for one to whom evolution was a sealed book. Burchell was driven to believe that it was part of the fixed and inexorable scheme of things that these strange superficial resemblances existed, and that was the end of the matter. Thus, when he found other examples of Hemipterous mimics, including one (*Lutera macrophthalma*) with 'exactly the manners of a Mantis,' he added the sentence, 'In the genus *Cimex*¹ (Linn.) are to be found the outward resemblances of insects of many other genera and orders,' February 15, 1829. Of another Brazilian bug, which is not to be found in his collection, and cannot therefore be precisely identified, he wrote: '*Cimex* . . . Nature seems to have intended it to imitate a *Sphex*, both in color and the rapid palpitating and movement of the antennæ,' November 15, 1826.

We must now leave this fascinating subject of mimicry, upon which even further observations made by this great naturalist might have been quoted had space permitted. I pass by the kindred subject of concealment or protective resemblance as a means of defence in the struggle for existence, although here too many examples of the deepest interest might have been chosen from his note-books. But a few admirable instances of this principle have been already discussed in the earlier pages,² and I therefore propose to consider a few out of Burchell's many unpublished contributions to a very different subject, which has received much attention and caused great

¹ Here used as equivalent to Hemiptera.

² See pp. 14, 15.

interest to naturalists in recent years. I refer to the sounds made by insects and other organisms distantly related to them.

In 1900, C. J. Gahan, the distinguished student of the Longicorn beetles, published the description of a new sound-producing apparatus in the Prionid genus *Ctenoscelis*.¹ There was no known record of the production of sound by these beetles, nor has there been any since the appearance of Gahan's memoir. I find, however, that a specimen of the large Prionid beetle *Ctenoscelis acanthopus*, in the Brazilian collection, bears the date '3 P.[M.], 5.11.25,' when Burchell was on his excursion from Rio into Minas Geraës (October 6 to November 16, 1825). In the note-book under the same day and hour we read, 'A *Prionus* found alive in the rancho at João Alfonso's. It makes a singing noise, similar to that made by many *Lamiæ*.' Burchell had, in fact, heard and recorded the sound three-quarters of a century before the sound-producing apparatus had been discovered.

Again, the curious flattened beetles of the family *Passalidæ* have only recently been shown, by Mr. Babb, of Massachusetts, to possess a sound-producing apparatus and to produce sounds. In Burchell's Brazilian collection six beetles of this group bear the number '1142.' Turning to the manuscript note-book we find, '1142. *Passalus*. Found under large chips of wood in the forest. In the manner of *Carabi*, but it does not run a fourth so quickly. Judging from large holes in these chips its larvæ are bred there. On taking it in the hand it makes a faint [sound] between a hissing and a squeaking; like the *Lamiæ*.'² The observation is dated December 9, 1826, and the locality was Rio das Pedras, Cubatão, near Santos.

The following observation is even more interesting, inasmuch as it led, directly it became known, to the discovery of a sound-producing apparatus of an entirely new type in scorpions. In his Brazilian note-book Burchell recorded, on December 3, 1828, when at Porto Réal (now Porto Nacional), on the Tocantins River, that a scorpion denoted by the reference number '1247' 'makes a noise between a hiss and a whistle with its pectiniform appendages,' the well-known pair of curious comb-like structures on the ventral surface. R. I. Pocock, F.Z.S., the authority upon scorpions, who has made a special study of their sound-producing organs, was shown the note, and expressed the opinion that Burchell was mistaken; for (1) no American scorpion was known to produce a sound, (2) no scorpion of any kind was known to make use of its pectiniform

¹ *Trans. Ent. Soc. Lond.*, 1900, p. 448.

² *Proc. Ent. Soc. Lond.*, 1904, December 7, pp. lxxxiii, lxxxiv.

appendages for this purpose. The collection was searched, and the scorpion bearing the number '1274' soon found. It was submitted to Mr. Pocock, who identified it as *Rhopalurus borellii*, one of his own species, only described in 1902! Guided by Burchell's note, Mr. Pocock then examined the appendages and the area beneath them, and at once found a new sound-producing organ, which he described and figured.¹

These few brief examples, selected from the mine of wealth hidden in the unpublished records of this wonderful observer, will, I think, lead every naturalist to sympathize with the hope expressed by Dr. Adam White in 1848: 'It is to be wished that he [Dr. Burchell] would give to the world some of his "field notes" made during his travels in South America.'² This hope is, I trust, destined to be fulfilled at no distant date, at least as regards all the notes which can be recovered.

Burchell's views on collections, published in 1822, were broad and scientific, as will be seen at once in the following admirable paragraph: 'It must not be supposed that these charms [the pleasures of Nature] are produced by the mere discovery of new objects; it is the harmony with which they have been adapted by the Creator to each other, and to the situations in which they are found, which delights the observer in countries where Art has not yet introduced her discords. To him who is satisfied with amassing collections of curious objects, simply for the pleasure of possessing them, such objects can afford, at best, but a childish gratification, faint and fleeting; while he who extends his view beyond the narrow field of nomenclature beholds a boundless expanse, the exploring of which is worthy of the philosopher and of the best talents of a reasonable being.'³

It is a strange thing that the man who thought and wrote in this way should himself have brooded over the possession of specimens. That this was certainly the case with Burchell can be proved by many records, of which the following is the most striking. It is contained on a folded sheet lying loose between the pages of his African Catalogue of Insects. He had exchanged some specimens with the Australian naturalist W. S. Macleay, and the sheet bears the list of what Burchell received. It appears to be quite a generous return for the insects given by Burchell, which are also recorded on another sheet. In spite of this the genial Macleay had written at the end of his list,

¹ *Ann. and Mag. Nat. Hist.*, 1904, p. 56, Plate iv.

² Appendix to Methuen's *Life in the Wilderness*, London 1848, p. 355.

³ Vol. i. p. 505.

'I shall take an early opportunity of looking out more genera for Mr. Burchell.'

Beneath this Burchell had written in pencil '(which has never been done. 4.9.46. 14.6.60).' Furthermore, at some later time he had rewritten the words, figures and first parenthesis, in ink. Consider what all this means in this life. The insects were received in 1824, when he was about forty-two years old. Twenty-two years later, when he was about sixty-four, Burchell noted that Macleay had forgotten to carry out his promise. Fourteen years later, at about the age of seventy-eight, he redated the note. Still later, at some time between June 14, 1860, and March 23, 1863, he rewrote the statement in ink.

We have now to attempt to penetrate the mystery which surrounded Burchell after his return from Brazil, and, as far as possible, to ascertain what was the nature of his work. A careful study of the botanical manuscript at Kew will probably throw much light on this question. In the meantime such results as I have had the opportunity of gaining from this source are briefly summarized :—

'The Brazilian Herbarium (including those of Portugal, Madeira, and Teneriffe), collected between 25 March, 1825 (arrival at Lisbon), and the 10th February, 1830 (sailing from Pará), was begun to be unpacked at Fulham on 3rd February, 1847, and ended on 15th Feb., 1850.' After this general statement there follows the exact date at which each of the 132 parcels of plants were opened.¹ There is also a long and detailed account giving the condition of each parcel, from which we find that the earlier lots had suffered from water or damp. It is probable that the insects missing from the Brazilian collection are to be accounted for in the same manner, as the gaps among these are far more numerous among the first-made captures. As the parcels were unpacked the specimens were arranged in fresh botanical paper, the total quantity of which cost £38 (£35 11s. 6d. and £2 8s. 6d. 'loss by exchange'), and weighed, without the plants, 1,930 lb., or nearly a ton.²

¹ Other work was, of course, carried on simultaneously. Thus among the papers recently received from Mr. Francis A. Burchell is the following record :—

'Register of the Thermometer of the Wind, and of the Weather, at Church-field-House; Fulham, (&c;) from the 29 August 1844, till the 16 of June 1852. Kept by Wm. J. Burchell.'

A paper in the Brazilian note-book shows that the work of relaxing and setting the insects occupied many years, and was finally finished on September 26, 1846. The dates at which the Lepidoptera were done are published in *Ann. Mag. Nat. Hist.*, April 1904, p. 308.

² All these data concerning the herbarium are extracted from *Memoranda Botanica*, MSS. I, Part II., at Kew.

Brazil was an interesting contrast to Africa as regards the vitality of the seeds brought home by Burchell. From forty-three parcels of Brazilian seed sown May 27-29, 1830, only about eleven plants grew, and all of these died within the first year.

After unpacking and arranging in fresh paper there followed an interval of six years before Burchell began, on January 28, 1856, to re-label his Brazilian Herbarium. The work was completed on May 5, 1860, over 49,000 specimens having been dealt with. Referring to this work there are many calculations—based upon the time occupied in cutting up a few bundles—of the period that would be required to cut up the whole. The frequency with which this calculation is repeated for the bundles still remaining seems to show a painful eagerness to get the data supplied in their final form during his life.

When the last label was fixed, on May 5, 1860, all detailed labour upon his collections was probably over. The following significant entry shows the kind of work which immediately succeeded: 'On June 11, 1860, I finished the rubbing out of the pencil writing which I had any where in all my African & Brazilian Catalogues replaced in China Ink of *this* tint, consisting of 24 8vo. vols. and 1 folio (vol. 9).'

¹

Inscriptions similar to that quoted on p. 10 were also probably written at the close of his career after the collections were supplied with data.

As time went on, and he still laboured at the details of his herbarium and zoological collections, the man who had started as a traveller admirably equipped with a knowledge of every science of the time was left behind by the onward sweep of scientific work. Mighty discoveries shook the world, but left him unheeding in his study. 'I well remember,' Sir Joseph Hooker writes, 'one conversation with him at the Linnean (in the fifties?) when he told me he had never even heard of photography, and showed great interest in my account of it!'

²

Burchell committed suicide on March 23, 1863.³ He would have reached the age of eighty-one or perhaps eighty-two (see note 2 to p. 4) on the 23rd of the following July. It is stated that 'he shot himself under the large cedar tree in front of Churchfield House. The wound not proving fatal, he terminated his existence by hanging himself in a small outhouse at

¹ All these data concerning the herbarium are extracted from *Memoranda Botanica*, MSS. I, Part II., at Kew.

² March 29, 1903.

³ The anniversary of the death of his friend R. A. Salisbury (March 23 or 24, 1827); but the coincidence was probably accidental.

the back.' ¹ The finding of the jury was 'Suicide during temporary insanity.' ²

Burchell's will is dated March 2, 1841, and no further alteration was made after this date. There is no reference to his collections or manuscripts. After leaving money or property to his sisters, Mrs. Jackson (and to her husband), Mrs. Butcher and Miss Anna Burchell, the rest of his estate was bequeathed to his sister Miss Mary Burchell, whom he made his sole executrix. Mary Burchell died before her brother, and the residuary estate passed to Miss Anna Burchell.

Sir Joseph Hooker, to whom I owe so much in the attempt to learn the details of Burchell's career, tells me that he never knew anything of the circumstances that led to his death. He makes the following deeply interesting suggestions as to the possible state of mind which led to the act: 'He could not make up his mind either to publish his own labours or to let others do so, or join him in the work. This and the reproaches of a sensitive mind and highly strung nervous system in a shy man of great mental power and resources, coupled with the memory of great deeds as a traveller, collector, artist, musician and scientific investigator, may well have led to despondency and suicide.' The study I have made of his manuscript ³ has led to the belief that the close of the long labour upon his collection was indirectly the cause of the state of his mind; and that if the rearrangement of his plants and insects and the supply of data to his specimens had not been completed he would have persisted with unflagging determination to the end. But his life-work was over. It was manifestly impossible, when he was over eighty, to undertake an entirely new line of work, which, moreover, could not be even begun without the co-operation of other naturalists, the very men whose companionship he had shunned for the long years in which he was resolutely working upon his collections. This great man spent his life, after his return from Brazil, in building a mighty monument for posterity. That he might achieve more he built secretly. It is our duty and our responsibility to reveal the stately fabric to the world.

¹ C. J. Férét, *Fulham, Old and New*, London 1900.

² This information was kindly supplied to me (June 2. 1903) by the Registrar-General.

³ Especially *Memoranda Botanica*, MSS. I. Part II., at Kew

THE COLLECTIONS

OF

WILLIAM JOHN BURCHELL, D.C.L.,

IN THE

HOPE DEPARTMENT, OXFORD UNIVERSITY MUSEUM.

3 A

I. *Introduction.* By EDWARD B. POULTON, D.Sc., M.A.,
Hon. LL.D. (Princeton), F.R.S., F.L.S., F.Z.S., F.G.S.,
President of the Entomological Society of London, Hope
Professor of Zoology in the University of Oxford, Fellow
of Jesus College, Oxford.

*University Museum,
Oxford, 1903.*

[Plate I.]

WHEN, in June 1893, I was first placed in charge of the Hope Collections of the University of Oxford my attention was at once arrested by specimens of insects and other arthropods collected in South Africa about ninety years ago, and much larger numbers from Brazil with dates going back about three-quarters of a century. I was struck by the precision and detail of the data and by the existence of numbers which evidently referred to a diary. Three manuscript note-books were eventually found in the Hope Library, and these showed that the material had been collected by the great naturalist William John Burchell, truly described by Swainson as "one of the most learned and accomplished travellers of any age or country—whether we regard the extent of his acquirements in every branch of physical science or the range of the countries he has explored" ('Cabinet Cyclopædia' of Dionysius Lardner, vol. Taxidermy &c., Appendix, p. 383 : London, 1840).

The first necessity was to ascertain if the data were as accurate as they were full and elaborate. A single quotation from the Brazilian note-book throws much light upon this important question. From Oct. 6th to Nov. 16th, 1825, Burchell was upon an expedition into Minas Geraes from Rio de Janeiro. The following note refers to the beetles collected on four days towards the end of this journey :—

“All the Coleoptera of 3rd, 4th, 5th, and 6th have since been marked 4. 11. 25, as the different day's collections being mixed in one paper could not be distinguished. They were, however, all caught in forests or on the edge of forests. Some other Coleoptera caught on these same days, but which were put up in separate papers and marked, are properly distinguished by their labels, but those *certainly* of the 4th are marked 4. 11. 25, with the 4 underlined, and consist of only a few minute insects caught at night by the candle.”

It is obvious that the man who wrote that note was a man to be trusted, and the immense numbers of his unpublished observations on natural history at once acquire the value of records by a trained naturalist with a fanatical love of truth for its own sake. Here, then, was the means of carrying back the detailed record of the occurrence of many thousands of species in two most interesting parts of the world, and to construct a trustworthy standard by which to measure the rate of future change; for one great justification of the immense funds which are expended on museums is that they will serve this very purpose for generations yet to come. The critical examination of the Burchell specimens proves that with ordinary care and the exclusion of light insects' pigments will endure for probably an indefinite period. Many of these specimens have not had ordinary care during a part of their history, the African collection being especially attacked by *Anthreni*, probably between 1825 and 1830, when Burchell was travelling in Brazil. But even upon the most fragmentary of these the patterns are still quite distinct and have undergone hardly any change.

The collection, combined with the manuscript notes on labels and in the note-books, furthermore supplies a great body of observations on habits, instincts, &c. which are still imperfectly known, and often altogether unknown. In many cases I find the records of interesting observations since made and published by others, such as the sound produced by the South-American butterfly, *Ageronia feronia*, described by Darwin in the “Voyage of the ‘Beagle’” (London, 1876, pp. 33, 34), or the habits of the driver-ant (*Eciton*) and leaf-cutting ant (*Ecodoma*), described by Darwin, Belt, Bates, &c.

When I first began to arrange for the publication of an account of the Burchell Collections at Oxford it was intended to prepare an introductory memoir upon the life of the great naturalist himself; but this proved to be too extensive an undertaking for these pages, and it is hoped that the "Life" will appear as a separate work at no distant date. In the meantime a brief abstract of the chief facts which I have been able to bring together is set forth below as an introduction to the papers which will follow.

William John Burchell, the eldest son of a nurseryman at Fulham, was born in the year 1781 or 1782. He received an excellent education, as is proved by the admirable style of his published works, the facility with which he wrote Latin, and the number of sciences with which he was intimately acquainted. His manuscript notes on South-African insects in the Hope Department are written on the blank sides of the pages of his French exercise-book—a history of Greece translated into French in 1794, when he was about twelve years old. Burchell was also an accomplished artist and musician. He must have had a remarkable constitution, for he enjoyed uninterrupted good health and vigour throughout his long and, but for the presence of native attendants, solitary journeys. He laboured throughout the whole of the time with astonishing energy—collecting, observing, recording, sketching, and writing elaborate journals. The details of his tragic end in his 81st or 82nd year also show that he possessed extraordinary resolution at that advanced age.

Burchell's features at about thirty-four years of age are preserved in a drawing made by J. S. Cotman in 1816, the year after the South-African travels had come to an end. The drawing was etched by Mrs. Dawson Turner, the grandmother of Sir Joseph Hooker. The portrait, of which there is a copy at Oxford, brings back to us Burchell in the full vigour of manhood. The face is highly intellectual and indicative of strong purpose and resolution, yet singularly attractive, even winning. The appreciation and description in his South-African travels of many a quaint incongruity shows that he possessed an ample fund of humour. His invariable breadth of view and justice are well seen in the calm discussion of the methods and results of missionary labours and his accounts of the shabby treatment he received from some of the Boers, in which he always warns the reader against coming to a too hasty conclusion as to the character of a whole people.

In 1805, when he was about twenty-three, Burchell was appointed "Schoolmaster and acting Botanist" at St. Helena

by the East India Company, and he remained in the island for five years, until his departure for Cape Town in order to begin his South-African travels. He was elected a Fellow of the Linnean Society, Feb. 15, 1808. The romance of his life happened in St. Helena, and probably exerted a profound influence upon his character, explaining much that is difficult to understand, and especially the secretive barren period which followed his return from Brazil in 1830. His parents had disapproved of Burchell's engagement to a Miss Lucia Green of Fulham, and had, perhaps, obtained the appointment in St. Helena, hoping that everything might be forgotten. In 1807, however, they relented, and made arrangements for the lady to come out and join their son in the island. During the voyage the captain of the ship paid attention to Miss Green, and she broke off the engagement. Burchell had always been a naturalist and collector, but it is probable that the terrible shock drove him into these pursuits and away from companionship with his fellow-men, for consolation or, at any rate, oblivion. Natural history pursued in this spirit, especially when habits become fixed and deepened with advancing age, is only too likely to lead to the non-productive life of the recluse, poring for long years over his collections, jealously guarding them from the sight of others, and yet giving no account of them to the world.

We now enter on the next great period of his life, the five years (1810-1815) of splendid work in South Africa. The first part of his travels, discoveries, and observations are described in the classical 'Southern Africa' (vol. i. London, 1822, vol. ii. 1824), covering the period between his landing at Cape Town on Nov. 26, 1810, and his departure from Litakun on Aug. 3, 1812. The work contains a large and excellent map, showing the whole of his route. He had intended to follow up these volumes by a complete account of the whole journey, but this was never accomplished, and the manuscript of his journal and other materials from which it might be written have not yet been found. The fine collection of insects which he made in St. Helena and South Africa was almost destroyed by neglect, probably during his absence in Brazil (1825-30), but hundreds of species can be named from the fragments preserved in the Oxford Museum. The botanical collections, now at Kew, did not suffer in the same way, and are in excellent condition.

Burchell remained in England during the ten years which intervened between his South-African and Brazilian journeys. He sowed in his garden at Fulham hundreds of South-African seeds and some from St. Helena, keeping a careful record, now preserved at Kew, of the dates at which they

came up. On Sept. 30th, 1817, he presented forty-three skins of South-African quadrupeds to the British Museum, and the neglect of these specimens, many of them unique, was the cause of his quarrel with that Institution ('Southern Africa,' vol. i. p. 383 &c., vol. ii. p. 336 &c.).

A letter to Sir William Hooker, dated March 31, 1819, shows the care he took to suggest appropriate names for the new species which he had discovered:—"I should mention that it was my practice when on my travels to give such specific names to my plants as the view of them in their native place of growth naturally suggested, without attending to their being new or not, which I had not always on the spot time to ascertain; but my object in thus naming them was that on my return to England I should find all the new species with more appropriate names than an inspection of the dried specimens in the herbarium might probably suggest to me." An examination of his Brazilian note-book proves that he adopted the same excellent method in his later travels.

In 1819 Burchell was called to give evidence before a Committee of the House of Commons on the question of emigration as a relief from pauperism. In his evidence, which occupied nearly three hours, he advocated the suitability of the Albany district in the easternmost part of Cape Colony. In a few days the Committee reported, and a grant of £50,000 was voted for this purpose. Burchell then amplified and published his evidence in a pamphlet, 'Hints on Emigration to the Cape of Good Hope' (London, Aug. 1819). This was savagely attacked in the 'Quarterly Review' for the following November, and Burchell replied in a sheet of four pages bound into the first volume of his 'Southern Africa.' Looking at the controversy from the standpoint of the present day, there can be no doubt that Burchell was entirely right and that the loyalty of the Grahamstown district, which has shone so conspicuously during recent years, is in large part the outcome of his wise advice.

More than all the work described above, the arrangement of his South-African collections and the preparation of the two volumes on South Africa occupied Burchell's time until he began to get ready for his next great journey.

Of the five years in Brazil very little is known, mainly because Burchell published nothing after his return. Hooker's 'Botanical Miscellany' (vol. ii. 1831, pp. 128-133) contains some very interesting extracts from his letters to Sir William Hooker, and the life of Burchell in the Dictionary of National Biography' (vol. vii. London, 1886, p. 290) also has an excellent short account of these travels.

Inasmuch as the Brazilian collections of insects &c. are far more extensive than the African, and are, considering their age and the vicissitudes through which they have passed, in excellent condition, the following papers will be chiefly concerned with them, and it becomes of the utmost importance to show the exact route traversed by Burchell. This is clearly shown by the map on the accompanying Plate I., prepared from the data obtained by Miss Cora B. Sanders, of Lady Margaret Hall, Oxford. The data were gained by a careful study of Burchell's manuscript note-books at Oxford, and especially the Index to the Localities of the Plants and Insects. Miss Sanders was able to find many of the names which have disappeared from modern atlases by an examination of the older maps of Brazil in the possession of the Royal Geographical Society. The numerous smaller villages, halting-places, streams, &c. mentioned in the manuscript note-books or upon the specimens themselves will always be described as between or near places which have been thus identified and are indicated upon the map. As regards Burchell's two expeditions from Rio de Janeiro into Minas Geraes and the Organ Mountains, hardly any of the places mentioned could be found; but it is clear from the time occupied and the account of the work done that he did not travel far.

Following the exact data which Burchell always records, we find that he left Fulham at 9.30 A.M. on March 10, 1825, and sailed from Portsmouth at 9 A.M. on March 15th. The main outlines of the journey are set forth below in a tabular form copied from a paper gummed into one of his manuscript note-books in the Hope Department, viz. "Index to the Localities of the Plants in the Brazilian Herbarium &c., serving also for the Localities for the Collection of Insects &c." The only modification of Burchell's original table is the insertion of the two expeditions from Rio in their proper positions in time, instead of placing them at the end, and thus putting the three separated periods in Rio itself in juxtaposition.

PLACE.	DATES.	TIME.	
		MONTHS.	DAYS.
Voyage .....	.....	....	11
In Portugal	{ 25. 3. 25 } { 25. 5. 25 }	2	0
Voyage .....	.....	....	5
Madeira.....	29. 5. 25	....	1

Rio July 1825 - Sept. 1826. Santos Sept.-Dec. 1826.

Porto Real Nov. 1828-Apr. 1829. Pará June 1829-Feb. 1830.

PLACE.	DATES.	TIME.	
		MONTHS.	DAYS.
Voyage .....	.....	....	2
Teneriffe	1. 6. 25	....	2
Voyage .....	.....	1	16
Rio de Janeiro	{ 18. 7. 25 {	1	4*
Minas Geraës	{ 6. 10. 25 {		
	{ 6. 10. 25 {		
	{ 16. 11. 25 {		
Rio de Janeiro	{ 16. 11. 25 {	....	27
	{ 5. 2. 26 {		
Organ Mountains	{ 6. 2. 26 {		
	{ 2. 3. 26 {		
Rio de Janeiro	{ 2. 3. 26 {	[total time spent in Rio] }	11
	{ 10. 9. 26 {		
Voyage from Rio .....	.....	....	3
Santos	{ 12. 9. 26 {	2	21
	{ 2. 12. 26 {		
Cubatão	{ 3. 12. 26 {	1	14
	{ 17. 1. 27 {		
Travelling .....	.....	....	3
S. Paulo	{ 20. 1. 27 {	6	4
	{ 24. 7. 27 {		
Travelling	{ 25. 7. 27 {	3	8
	{ 2. 11. 27 {		
Goyaz	{ 3. 11. 27 {	9	18
	{ 21. 8. 28 {		
Travelling	{ 22. 8. 28 {	2	22
	{ 13. 11. 28 {		
Porto Real	{ 14. 11. 28 {	5	13
	{ 27. 4. 29 {		
Travelling (Tucantins) .	{ 28. 4. 29 {	1	13
	{ 10. 6. 29 {		
Pará	{ 10. 6. 29 {	8	0
	{ 10. 2. 30 {		
Voyage .....	.....	1	15

* This number is given by Burchell. He probably deducted the days spent in travelling from and to Rio.

Burchell landed at Dover on March 24th, 1830, and reached his home in Fulham on the following day.

The journey originally planned by Burchell was far more extensive. Thus he wrote to Sir William Hooker from Rio (July 8th, 1826) :—

“ . . . It is at least my *wish* to visit the city of S. Paulo, and thence by land through the provinces of Goyaz, Cuyaba, and Matto Grosso into Peru, having the city of Luzco as my principal object; and after doing in Peru as much as my time (for my family prefer my being in England) and slender means will allow me to do, I should wish to proceed by land to Arequipa, Potosí, Salta, &c., &c., to Buenos Ayres, and thence to my home at Fulham. . . ”

A letter nearly two years later to the same friend explains the change. It is dated from Goyaz, April 25, 1828 :—

“ . . . I have kept my original plan always in view, and had advanced thus far on my way to Peru &c. when letters from Fulham overtook me, stating that my dear father's health, from the infirmities natural to his age, was gradually declining, and that it was his wish and that of the rest of the family that I should return directly to England. Whatever regret I may feel at thus relinquishing my American travels, and whatever disappointment I may experience from a premature return, I have no hesitation whatever in preferring filial duty to science and the gratification of my own inclinations. I have therefore greatly altered my plans, and instead of ending this journey at Buenos Ayres, shall, *Deo volente*, end it at Pará, where I shall embark for England.”

Burchell was not destined to see his father again, for Matthew Burchell died soon after this letter was written, on July 12, 1828.

An excellent brief account of the Brazilian journey is given in a letter to Sir William Hooker, written from Burchell's home at Churchfield House, Fulham. Much of it is printed in ‘Hooker's Botanical Miscellany’ (vol. ii. 1831, pp. 128–133). The original letter, together with the others which have been made use of on the present occasion, are preserved in the Herbarium of the Royal Gardens at Kew. The letter is dated Nov. 1, 1830 :—

“ I left England in March 1825, passed two months at Lisbon and in the vicinity: landed at Rio de Janeiro in July, where I continued making collections in botany, entomology, and geology, &c., till Sept. 1826, during which period I visited a part of Minas Geraës. While at Rio I made some drawings of landscape, among which was a panorama taken from a hill in the middle of the city; many astronomical,

philosophical, and geodetical observations. I finally quitted Rio in Sept. 1826, and proceeded by sea to Santos, where I remained three months, and then proceeded and took up my station in a solitary hut in the midst of forests at the foot of the great range of mountains, for the purpose of exploring them at leisure. My next station or headquarters was at the city of S. Paulo, nearly under the tropic of Capricorn, where I remained about seven months, extending my excursions in various directions. Having there purchased a troop of mules and engaged the requisite muleteers, I travelled northward, and finally took up my station at the city of Goyaz, being the first and only Englishman who has entered that province. There I passed the rainy season of 1827 and made large collections, being detained there nine months, owing chiefly to the difficulty of finding the means of conveyance for my baggage. At length, resuming the road and still continuing Northward, I reached in November 1828 Porto-Real, on the great river Tucantins. Here I remained till the proper season for embarking, and, descending the stream, at all times rendered dangerous by numerous rocky falls, rapids, and whirlpools, I made considerable collections on ground over which no scientific traveller had ever passed. I completed a survey of the whole length of this voyage, fixed by numerous astronomical observations. Finally, I arrived at the city of Pará in June 1829, and, while waiting till February for a convenient opportunity of embarking for England, added largely to my collections both in zoology and botany. Of this city I made a panorama, which, with that of Rio, I hope perhaps to succeed in getting engraved, together with my landscapes &c. Of insects I found from 16 to 20 thousand specimens (at a guess). Of birds I shot and preserved 362 species. In the other classes a proportionally smaller number. I am not aware of any part of my collections being lost, though I daily lament my inability to unpack them for want of room in the house. The space I require is large, and I have some hesitation in building on bishop's land, unless it were possible to enfranchise it. I fear I shall lose much time before I am comfortably settled: nothing is more distressing to me than thus to be forced to delay my labours in arranging my collections and rendering them useful to science. You, who are so great an example of industry, complain also of overwhelming collections, and feel the necessity of manual help. But I have nowhere beheld an herbarium so large as my own; and, added to this, I cannot bring my mind to abandon any branch of natural history for the sake of giving more time and attention to any one in particular; although I

know this is wrong and can never lead to perfection in any. Still the contemplation of the whole system of created objects is so fascinating that it is very diffic[ult to] turn away from all but a few."

These latter sentences, together with the considerations mentioned on page 4, help us to understand Burchell's unproductive later years. Living secluded in the midst of his vast collections, he wandered from one point to another without the stimulus to work out any one part thoroughly which contact with his brother naturalists would have supplied. Furthermore, he belonged to that class of men, much rarer now than formerly, who value and gloat over collections as collections. His letters, even to his most intimate friends, such as Sir William Hooker, as well as many records preserved in his note-books, show that he jealously watched over the material of his collections, and indicate that he suffered much anxiety on this account. His will, which was proved for probate at under £4000, also shows that he was right in the contention that he could not afford to employ assistance in the skilled mechanical work which was required, while his almost too-scrupulous care and attention to detail must have consumed an immense amount of his time. Sir William Hooker had evidently urged him to employ a curator or librarian, for Burchell's letter of June 25th, 1835, contains the following passage:—"After the consumption of so much of my property by my travels and the disinterested pursuit of science all the rest of my life, the obtaining of assistance by payment is quite out of the question." Similar advice had been given and answered in the same sense five years before.

The degree of D.C.L. *Honoris Causa* was conferred upon Burchell by the University of Oxford on May 8th, 1834. Daubeny, the Professor of Botany, had given his inaugural address on May 1st, and the first lecture of his first course (on Vegetable Physiology) was delivered on May 8th. It seems probable that Burchell came to Oxford in order to be present, and that the occasion was selected for the conferment of the degree.

There is no doubt that Burchell expected a government pension and that he bitterly resented what he regarded as undeserved neglect. Hence, to the other causes which operated to prevent productive work, we must add the brooding melancholy and the bitterness of a disappointed man, the man with a grievance.

It is probable that he freely communicated his ideas on this subject to his friend Swainson, and that the attack on the government for neglect of Burchell was a result of their intimacy.

These severe criticisms may be seen in Swainson's article, of which a part is quoted on page 1. The same article is probably responsible for exaggerated statements, which have been constantly repeated, as to the condition of his collections and the assertion that they were never unpacked. It was probably an extreme way of indicating the injury which science was receiving because Burchell remained unassisted. But it was certainly exaggerated. In the note-books at Oxford there is the record of the different dates at which he accomplished the setting of the various groups of Brazilian insects. Moreover, the beautifully written labels which nearly all specimens possess are very different from the hasty but distinctly legible notes made in the field. Many specimens still retain both labels, but generally the older ones have been discarded.

To this grievance against the government was added the further sense of failure in that others were continually gaining credit for work which he had done but had not published. Thus he wrote to Sir William Hooker on Sept. 3, 1832 :—

"I am vexed almost to death at all my fine collections being thus shut up from me while I am daily losing portions of the only reward a traveller has—that of his discoveries. . . . I trust that [in] future my work will make more show, at least to the world."

A few years later the same kind friend seems to have made a great and probably a final effort to induce Burchell to publish his results. Burchell's reply is dated June 25th, 1835 :—

"From the manner in which you express yourself with regard to my botanical collections you appear to be under very erroneous impressions, for to say that I '*will* not publish' is quite the opposite to what has ever been my intention, and the almost only pleasure I had in my travels to alleviate the excessive toil of forming them was the anticipating of the gratification of publishing them at my return to Europe, and of obtaining the satisfaction of being useful to science, and of securing the honor [spelt thus, according to his custom] due to my discoveries; and if I have been, and still am being, robbed of those honors by others, who, having less on their hands than I have, can run the publishing race with more expedition, I feel most sensibly the injury I sustain. Many circumstances have unfortunately concurred hitherto to tie up my hands, but I do and shall ever look to Natural History as a most delightful and congenial employment for my future years."

Probably owing to the combination of causes set forth above and their deepening effect as years went on, Burchell

became more and more of a recluse, and kept his collections more and more from the sight of other naturalists. The climax was reached when he refused the request of his old friend to allow his son, Sir Joseph Hooker, to see the collection of St. Helena plants, in order to help in the production of a work upon the flora of that island.

Towards the end of his life Burchell must have come to realize that his methods could lead to nothing. He committed suicide on March 23rd, 1863, in his 81st or 82nd year. It is stated by C. J. Fèret, in 'Fulham Old and New' (London, 1900), that he "shot himself under the large cedar tree in front of Churchfield House. The wound not proving fatal, he terminated his existence by hanging himself in a small out-house at the back."

Burchell's collections were not specially mentioned in his will (dated March 2, 1841). Upon his death in 1863 they came into the possession of his sister, Miss Anna Burchell, who offered the whole of them to the University of Oxford in the following year upon the condition "that separate rooms shall be set apart for them, and that the whole be put out, set up, and systematically arranged, and be called 'The Burchell Collection' or presented to the Museum by Wm. J. Burchell, Esq., D.C.L." The Delegates of the Museum were unable to accept these conditions. A few months later Miss Burchell wrote (April 8, 1865) concerning "the collections in Zoology and Entomology," "I am still desirous, in accordance with what I believe to have been his [Dr. Burchell's] wish, of presenting the same to the University of Oxford." The only condition was "that the Collections should be distinguished as those of my late Brother." This offer was gratefully accepted, and in a few weeks the collections arrived. About the same time the immense Herbarium was offered by Miss Burchell to the Linnean Society, which was unable to accept it. A little later it was presented to the National Collection at Kew.

In drawing up this brief account of Burchell, as a preface to the description of his collections, I desire above all to acknowledge the kind help I have received from Miss Cora B. Sanders in the study of Burchell's manuscript at Kew and Oxford, and of his collections in the Hope Department. It has been already mentioned that the map forming Plate I. is entirely due to Miss Sanders's researches. I have also received the kindest assistance and encouragement from Sir Joseph Hooker and also the authorities of the Royal Gardens at Kew. The Delegates of the Oxford University Museum have kindly given me access to their correspondence and minute-books.

3 B

II. *On a new Stridulating-organ in Scorpions discovered by W. J. Burchell in Brazil in 1828.* By R. I. POCKOCK, F.Z.S.

[Plate II.]

UP to the present time stridulating-organs are known with certainty to exist in three genera of scorpions, namely, the Oriental genus *Palamnæus*, the tropical African and Arabian genus *Pandinus*, and the South-African *Opisthophthalmus*, all belonging to the family Pandinidæ. The certainty in these cases lies in the fact that in both *Palamnæus* and *Opisthophthalmus* the hearing of the sound preceded the anatomical investigation which led to the discovery of the organ, and that in the species of *Pandinus* an organ exists exactly similar in structure to that of *Palamnæus*, although the rasp and the vibratile bristles occur upon different segments of the chelæ and legs of the first pair in the two genera. What is believed to be a stridulating-organ has also been found in certain South-African species of the genus *Parabuthus*, which belongs to a totally different family, namely, the Buthidæ. Unfortunately in this instance there is no proof, based upon human perception of the sound emitted by the living animal, that the function of the organ described has been correctly interpreted. The tenability of the supposition, however, is justified by the structure of the organ and by the distinctly audible stridulation it can be made to yield, when the appropriate movements, all capable of being performed by the animal itself, are induced by artificial means on a freshly killed or alcohol-preserved specimen.

In the Pandinidæ the stridulating-organs have been developed in connexion with the anterior appendages. In *Opisthophthalmus* it consists of large foliaceous bristles on the inner (preaxial) surface of the basal segment of the chelicerae, and the sound given out by the rubbing of these appendages together is in many cases supplemented by the sound produced by the catching of certain short, erect, stiff bristles on the dorsal side of this segment against the anterior edge of the carapace as the appendages are forcibly withdrawn beneath it.

In *Pandinus* and *Palamnæus* it lies between the basal segments of the appendages of the third and fourth pairs, commonly called the chelæ and first pair of legs, and consists of a finely papillate area and an area beset with short erect

bristles exactly like those that are found upon the upperside of the basal segment of the chelicerae in *Opisthophthalmus* *.

In *Parabuthus* what is supposed to be a stridulating-organ is totally different both in structure and position. It is a finely granular or transversely ridged area upon the dorsal side of the first and second segments of the tail, possibly also upon that of the last tergal plate of the abdomen, and the stridulation above mentioned can be artificially produced by scraping the point of the sting over the roughened field in question †. A fairly similar but less differentiated system of granules, probably subserving the same end, is found upon the first segment of the tail in certain black North-African species of *Buthus*, namely, the Egyptian *B. bicolor* and the Algerian *B. venes* ‡.

Apart from the legs, which are almost immovably welded by their basal segments to the sternal surface of the body, the chelicerae, chelae, and tail are, with one exception, the only organs in a scorpion susceptible of vigorous and rapid movement. The one exception is the pectines. It is in connexion with these appendages that the stridulating-organ now to be described has been discovered §.

In the course of a recent study of Burchell's manuscript 'Note-book of Brazilian Insects &c.,' Professor Poulton found the following record under the date December 3rd, 1828:—

"1274. *Scorpio* of a light redish [thus] brown. Legs and claws pale. Several of these were caught in my house. I found one feeding on a large blatta which it held close to its mouth with its claws. '*Lacrdia*.' Makes a noise between a hiss and a whistle, v. J. 31. 12. 28, with its pectiniform appendages."

[The word "*Lacrdia*" evidently represents the native name of the species. Burchell always made a point of obtaining such names whenever possible, and took the greatest pains in writing them clearly and inserting accents. The reference "v. J. 31. 12. 28" apparently alludes to a Brazilian journal which has unfortunately not been found. It certainly did not reach either Oxford or Kew.—E.B.P.]

At once appreciating the interest and importance of the

* See Pocock, Nat. Science, ix. pp. 17-25 (1896).

† Pocock, Proc. Zool. Soc., March 1902, pp. 222-224.

‡ Pocock, Ann. & Mag. Nat. Hist. (7) x. p. 374 (1902).

§ Reference may here be made to the suggestion of Landois ('Tierrstimmen,' pp. 22-23, 1874), that the pectines might be capable of emitting sounds by friction. This idea, however, was not supported by facts, and, except that the guess has now been verified, it is on a par with Wood-Mason's view that the prehensile teeth on the digits of the chelae in Buthidae might also be used for this purpose (Proc. Ent. Soc. London, 1877, p. xix).

last sentence of the note, Prof. Poulton arranged for the collection to be searched for a scorpion bearing the number 1274. The specimen was soon found by Mr. W. Holland, and Prof. Poulton brought it to the Natural History Museum and asked me to determine it and to examine the pectines, to discover if possible the nature and situation of the stridulating-organ. This I undertook with the greatest pleasure, and with the result that the accuracy of Burchell's observation was substantiated to the full.

The specimen is a male and belongs to the Brazilian species that I described last year as *Rhopalurus Borellii*. Although dried, it is sufficiently well preserved to preclude all likelihood of error on this point; but without the relaxation or removal of the pectines the structure of the stridulating-organ could not be investigated. The examination necessary for this purpose therefore was carried out upon the three spirit-preserved examples the Museum possesses, namely, the type, an adult female, an immature specimen of the same sex, and an adult but badly preserved male.

Although only described seven months ago, this species has been known to me for ten years. Briefly told, its history and that of its allies is as follows:—In 1893* I pointed out that two American species of *Buthidæ* identified with the *Scorpio junceus* of Herbst and *Tityus agamemnon* of C. Koch differ from their allies in the structure of the pectines and of the first sternal plate of the abdomen. The pectines are unusually broad in their proximal half, and the overlying area of the sternal plate is depressed, the grooves which ordinarily pass forwards and inwards from the inner extremity of the stigma being exceptionally deep and lying nearer to the middle line, so that they define a narrow, smooth, triangular area, standing at a higher level than the depressed lateral portion already mentioned. On the strength of these structural features the genus *Heteroctenus* was established for these two species. It was also stated that *Heteroctenus junceus* differs from the form then referred to *H. agamemnon* in having the depressed area smooth instead of closely and finely but distinctly granular. Subsequently, as a result of the publication of Dr. Kraepelin's monograph† on the scorpions, it was found that these two species can scarcely be separated generically from the species described as *Rhopalurus laticauda* by Thorell and *R. princeps* by Karsch. Furthermore, the description given by Kraepelin, presumably from an examination of the type of *Tityus agamemnon*, proved my

* Journ. Linn. Soc., Zool. xxiv. p. 393.

† Das Tierr., Scorpiones et Pedipalpi, pp. 94-95 (1899).

previous determination of *agamemnon* to be erroneous. I therefore redescribed the species so determined under the new name *Borellii**, and at the same time attempted to show that the five species under discussion—namely, *junceus*, *lati-cauda*, *princeps*, *agamemnon*, and *Borellii*—possess certain characters in common of sufficient systematic value to justify their separation from the series forming the genus *Centruroides*, with which Kraepelin associated them, and to demand their recognition as a distinct genus for which the name *Rhopalurus* is available†.

The significance of the depressed sternal areas and of the expanded pectines in *R. Borellii* and *R. junceus* was always a puzzle, and would probably have remained unsolved, so far at least as I was concerned, had it not been for Burchell's until now unpublished discovery of three-quarters of a century ago. Probably the absence of the granules on the depressed sternal area in *R. junceus*, suggesting as it did the secondary importance of their association with the sternal depressions and with the pectinal expansions in *R. Borellii*, coupled with the flexibility, comparative softness, and known sexual physiological significance of the pectines in these and all other scorpions, combined to conceal the true construction, which, thanks to Burchell's observation, is now known to be assignable to the features in question.

How, then, is the sound described by Burchell as "between a hiss and a whistle" produced? Without doubt by sweeping the pectines across the granular field on the overlying sternal plate (Pl. II. fig. 2). When one of these organs is turned over it may be noticed that the teeth opposable to the granular area are not parallel-sided, as is normally the case in scorpions; the distal edge is sinuous, presenting towards the apex of the tooth a very decided bulge, which shows up as a slightly thickened area as it catches and reflects the light. When examined under a half-inch objective, or even a lower power, practically the entire face of the tooth, and especially the bulging area, is seen to be covered with a multitude of fine striæ lying parallel to the longitudinal axis of the tooth (Pl. II. fig. 3). That the structural modifications of the teeth above described are directly connected with the depression and granulation of the sternum is shown by the absence of such modifications in the teeth at the distal end of the series which lie beyond the granular area and sweep clear of it with the movement of the pecten. No doubt the expansion of the shaft of the pecten in its proximal half is correlated with an increase in the size of its muscles and of the surfaces to

* Ann. & Mag. Nat. Hist. (7) x. p. 375 (1902).

† Biol. Centr.-Amer., Arachn. Scorp. p. 37 (1902).

which they are attached to add force to the sweep of the organ.

Except for the apparent absence of the granules, the sternal depressions in *R. junceus* closely resemble those of *R. Borellii*. I originally described these depressions as smooth; this is only true relatively speaking. No granulation is visible under a lens of low power, and no roughness is perceptible with a pin-point; but when scrutinized with a half-inch objective the entire surface of the depression is seen to be exceedingly minutely shagreened, so minutely as to suggest that the sound emitted must be much finer than that which the organ in *R. Borellii* gives out. Nor is this all the difference between the two species. The pectines in *R. junceus* are expanded exactly as in *R. Borellii*, and the distal edges of the teeth bulge in almost precisely the same way, but the differentiation of the striæ is carried to a greater extreme. Along the edge of each tooth there is a distinct series of small tubercular elevations, which are largest where they cross the thickened bulging area, becoming smaller both above and below it. These elevations are very distinctly striated, and the striæ appear to be practically restricted to them (Pl. II. fig. 4).

In *R. laticauda*, Thor., the granules on the sternite are relatively as coarse as in *R. Borellii*, but the area is less depressed and less sharply differentiated both in front and towards the middle line than in that species. Also the posterior surfaces of the pectinal teeth are less visibly striated and the distal edges of those opposable to the granular area are straight and without the characteristic bulge so noticeable in *R. Borellii* and *R. junceus*. In all these features the organ in *R. laticauda* is less specialized than in the two species just mentioned.

The remaining species of *Rhopalurus* are unknown to me. Those who have had the opportunity of seeing and describing *R. princeps* have made no mention of any structural peculiarities in the pectines or in the first abdominal sternum. According to Kraepelin, who has seen the typical examples, however, this species is nearly related to *R. laticauda*. Hence it is permissible to suppose that it also possesses a stridulating-organ similar in its general features to the stridulator of that species. In the case of *R. agamemnon* the last-mentioned author states that the pectines are expanded and the sternum grooved and depressed as in *R. junceus*, but that the sternum differs from that of *R. junceus* in being distinctly granular on the median triangular area. This peculiarity, in which *R. agamemnon* holds a unique position in the genus, suggests that the median area in question constitutes an

integral part of the stridulating-organ. Whether the depressed areas are granular or shagreened, or neither, is at present unknown.

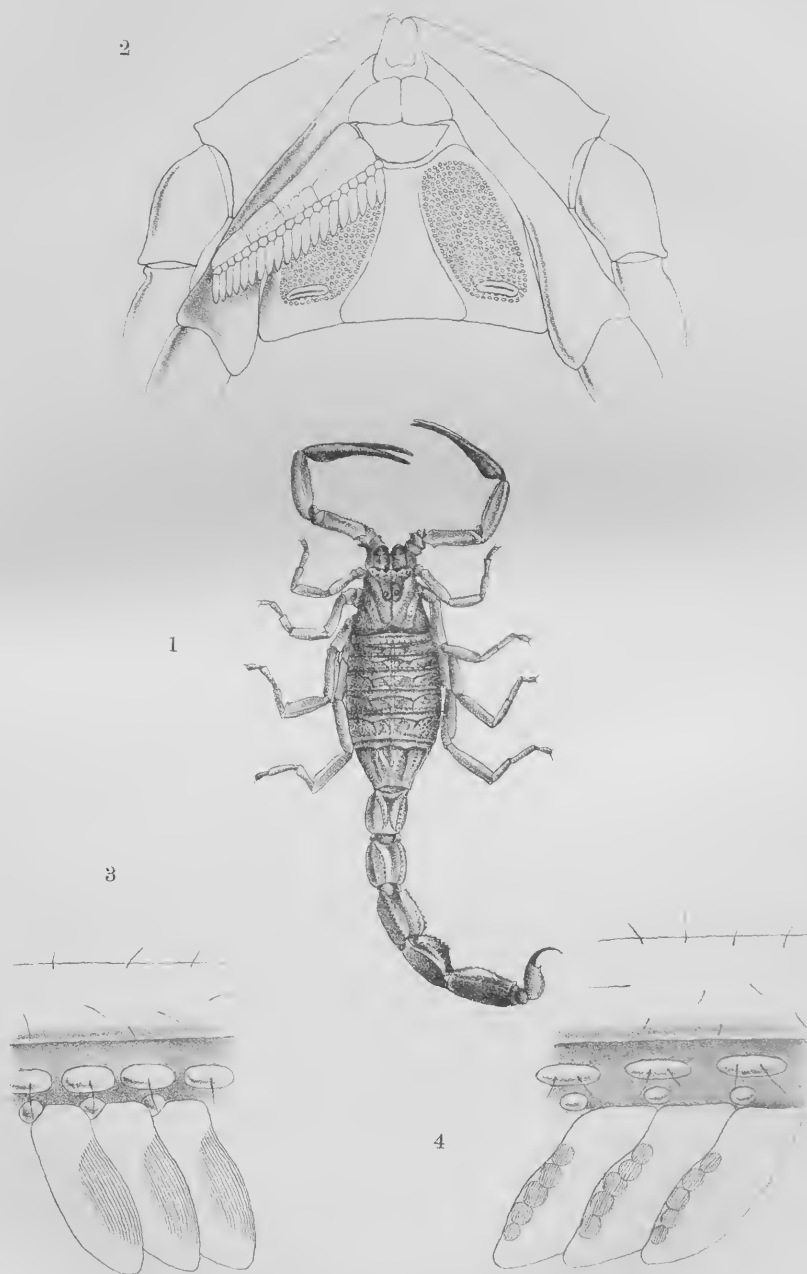
Two other important facts connected with Burchell's observation remain to be mentioned. The first is the discovery of stridulating-scorpions in America: those in which sounding-organs are known or supposed to exist have hitherto been recorded from the Mediterranean, Oriental, and Ethiopian regions. The second is the announcement of the exact locality of *R. Borellii*. *R. princeps* occurs in Hayti, *R. junceus* in Cuba*, *R. laticauda* in Venezuela and Colombia, whereas the only examples of *R. agamemnon* and *R. Borellii* hitherto known are labelled "Brazil," without further particulars. Thanks, however, to Burchell, we are now aware that *R. Borellii* is found in the Province of Goyaz, in the upper valley of the Rio Tocantins and that of at least one of its tributaries. Burchell was at Porto Real (now Porto Nacional) when he made his note on specimen no. 1274. Burchell's collection also contains another specimen of the same species (a female) bearing a label "Body and legs redish. Between the boxes at our station at Sape. 15. 10. 28." Referring to the Index we find that Burchell gives "S^a Brigida" as his locality on Oct. 15, 1828. Sape is mentioned on Oct. 14. The position is between Cavalcanti, his resting-place on Sept. 30th, and Conceição, which he reached on Oct. 18th, but apparently much nearer to the latter. A glance at Plate I. will show the positions of these two localities of *R. Borellii*.

So far as the function of the organ in these American Buthidæ is concerned, it need only be said that since it is equally well developed in both sexes, and occurs also in immature forms, there is no reason to suppose that it has any sexual significance. Hence, like the stridulating-organs of other scorpions and of the spiders of the family Aviculariidae, its significance must be regarded as purely aposematic.

EXPLANATION OF PLATE II.

- Fig. 1.* *Rhopalurus Borellii*, Poc., ♀, nat. size; drawn from typical example.
Fig. 2. Ditto. Ventral surface of anterior extremity of abdomen and of posterior extremity of cephalothorax, to show the granular areas on the first abdominal sternite, the pecten of the left side being removed.
Fig. 3. Ditto. Piece of the pecten seen from its dorsal side, to show the finely ridged stridulating area.
Fig. 4. *Rhopalurus junceus* (Herbst). Ditto.

* There are specimens in the British Museum labelled "Mexico" and "Brazil." These localities, however, require confirmation.



J. Green, Lith.

The Scorpion, *Rhopalurus Borellii*, and its Stridulating Organ.

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III. *Rhipidocérides et Malacodermes recueillis par W. J. Burchell dans ses voyages en Afrique australe (1810-1815) et au Brésil (1825-1830); avec la description de quatre espèces nouvelles.* Par J. BOURGEOIS.

I HAVE added to Mons. Bourgeois' memoir all the observations and data I can find recorded in Burchell's manuscript notes. Such additions are placed between square brackets. The numbers by which the specimens are brought into relation with the present series of papers are printed in heavy type to distinguish them from Burchell's reference numbers.—E. B. POULTON, Dec. 9, 1903, Oxford.

RHIPIDOCERIDÆ.

RHIPIDOCERA, Latr.

1. *marginata*, Kirby, 1 ♂.—Brésil.

[No. 215. Sept. 15, 1825, Rio. Burchell went for an excursion on this day "along the Aqueduct (from Sta. Theresa to the ridge above the valley of Laranjeiros)," but the words in his "Notes of Brazilian insects" probably indicate that he captured the insect in the house at Rio. "*Lampyris*. Non lucet. Caught in my room; perhaps brought in with the plants."]

MALACODERMATA.

Lycidæ.

LYCUS, Fabr.

Lycus in sp.

2. *ampliatus*, Fähr., 1 ♂.—Afrique australe.

[The specimen is numbered 82. The corresponding number in Burchell's manuscript "Catalogus systematius Insectorum in Itinere per Africam australem extratropicam" proves that the insect was captured on March 12, 1814, "in plantis" at Wagenbooms River, north of Plettenberg Bay. Burchell was in much uncertainty as to the determination of the species. He gives the names "*rostratus* ♀, Fab.," with an inverted query,

"*L. palliatus* ex verb. Lichtens[tein]." He also added the word "new" in pencil, and suggested the specific name "*scutatus*, B.," underlining it according to his custom. The specimen was also examined by Dr. W. E. Leach, of the British Museum, as is proved by a paper in his handwriting, dated by Burchell Nov. 28, 1818. This manuscript, which is bound into the "Catalogus," is a letter and list of the numbers upon over one hundred forms of Burchell's South-African insects, with determinations or such statements as "new," "unknown," "not described," "to be examined," &c. The letter speaks of other lists to follow "next week," but no more have yet been found. A postscript says "Do send me on Monday by post your names for the new species" [see above, page 5]. In nearly fifty cases such suggested names were written by Burchell in Leach's list. No. 82 is stated to be "new or not described," and the name "*scutatus*" is written opposite to the number here as in the "Catalogus."

"1 Duplicate L." indicates that one specimen was given to Leach for the British Museum. The letters "? S. L." in the "Catalogus" indicate that Burchell thought, but was not sure, that the species 82 also occurred at Sierra Leone, to use his own words, "according to a small collection sent to the Horticultural Society, and which I saw at the Linnean Society, 2. 8. 22."

There are three other references to no. 82 in Burchell's handwriting:—

(1) A series of notes headed "The following notes are the result of a collation of the whole of my African collection of insects, with the Banksian Cabinet (now belonging to the Linnean Society), the greatest part of which is named in the handwriting of Fabricius. 1823 to 1824"; and then, apparently added later, "but I fear some labels had been misplaced." In this list we find "82. *Lycus rostratus* ♀. Specimina Banksiana sunt paulò minora."

(2) Another undated collation headed "The following Notes are the result of a collation of all my African insects with the figures in Olivier's 'Entomologie.'" Here we find "82. *Lycus latissimus*."

(3) The third reference is on a single sheet in Burchell's handwriting, headed "Remarks on my African Insects by Mr. Wm. McLeay, 1 April, 1824." McLeay's opinion, as recorded by Burchell, was "all the *Lyci* are distinct species."]

3. *palliatus*, F., var. *pallulatus*, Dalm., 1 ♂.—Afrique austr.

[No. 31. Nov. 18, 1813, Uitenhage, Cape Colony.]

Chlamydolycus, Bourg.

4-9. *Burchelli*, sp. n., 3 ♂, 3 ♀.—Afrique australe.

[All captured at Uitenhage, Cape Colony, Nov. 18, 1813.]

♂. Breviter ovatus, fere opacus, supra ochraceus, thoracis disco (limbo antico excepto), elytrorum regione scutellari, macula magna laterali ad expansionem elytrorum, sutura trientequae apicali nigris; subtus niger, nitidiusculus, abdominis lateribus ochraceis; rostro brevior quam in *L. elevato*; prothorace transverso, subtrapeziformi, basi longitudine fere duplo latiore, apicem versus parum attenuato, antice subrotundato, lateribus medio paululum coarctatis, medio longitudinaliter sat profunde sulcato, angulis posticis extus vix productis, apice retusis; elytris in dimidio anteriori singulatim in expansionem magnam, supra concavatam et valde reflexam, infra autem convexam et declivem rotundato-dilatatis, dein ad apicem singulatim rotundatis, fortiter reticulatis, intervallis reticuli grosse rugoso-punctatis, costis 2 parum elevatis instructis; abdominis segmento penultimo postice in medio paululum triangulariter inciso, ultimo (8°) elongato-triangulari, bivalvato, omnino nigro; pedibus nigris, trochanteribus femorumque basi (tertii paris praecipue) plus minusve rufescentibus.

Long. 10-13 mill.; lat. max. thorac. $2\frac{1}{2}$ -4 mill.; lat. max. elytr. 8-11 mill.

♀. A mare differt elytris subparallelis, expansione elytrorum ad laminam elongatam, angustissimam, immaculatam redacta; abdominis segmento ultimo (7°) semilunato, integro.

Long. 10-14 mill.; lat. 6-8 mill.

Très voisin de *L. Poultoni*, Bourg. (Ann. Soc. ent. Fr. 1902, p. 739); en diffère surtout par la taille moindre, le rostre un peu plus court, le milieu de l'abdomen noir dans les deux sexes (chez *Poultoni* ♂ l'abdomen est entièrement ocracé) et par l'expansion humérale de la ♀ à peine marquée, réduite à une lame très peu saillante et allongée, d'où résultent, dans ce sexe, des élytres presque parallèles.

[The females are numbered 78 [7], 79 [8], and 80 [9]. The numbers in brackets are those of the specimens in the present paper. No. 78 was submitted to Leach and marked "not described," the name *oblongus*, B., being suggested by Burchell both here and in the "Catalogus," where "new" is written in pencil. In the Banksian Collation Burchell wrote opposite 78-80 "*L. proboscideus*? qui figuram habet elytrorum apice majus angustatam." In the Olivier Collation the same name is given to no. 80. The "Catalogus" mentions "5 duplicates" and a single "L.," indicating that one specimen was given to the British Museum.]

The males are numbered 86 [4] and 87 [5], and one bears the date 18. 11. 13 [6] without a number. No information is to be found concerning these three specimens, except the locality and date and the fact that there were "4 duplie. L."]

Merolycus, Bourg.

10, 11. *rostratus*, L., 2 ♂.—Afr. austr. [Uitenhage, Cape Colony, Jan. 16, 1814.]

12. —, var. *pyriformis*, Murray, 1 ♂.—Afr. austr.

[Burchell's no. 85 captured at the same date and locality as 10 and 11. "Mares gaudent elytris latioribus.—Fœm. angustiorib. Vix volentem vidi. Hab. in floribus" (Catalogus). In the Banksian Collation Burchell wrote "85. *Lycus*. Similis colore formâ *Lycus rostrato* qui tamen abunde differt rostro, et elytris paulo majoribus."]

CALOPTERON, Guér.-Mén.

13. *tropicum*, L. (*fasciatum*, F.), var. *humeralis immaeulatis*, 1 ♀.—Brésil. [Porto Real (now Porto Nacional), March 3, 1829.]

Le type de l'espèce a les élytres tachées de jaune aux épaules et paraît plus spécialement répandu en Guyane; j'en ai vu cependant plusieurs exemplaires du Brésil.

14-17. *brasiliense*, Cast. (*sinuaticolle*, Luc.). Color. typic.: elytris fuseo-nigris, macula humerali magna fasciæque lata transversa pone medium flavis; abdominis segmentis primis medio flavo-maeulatis (Bourg. Comptes Rend. Soc. ent. Belg. 1879, p. xv). 1 ♂, 3 ♀.

[The male [14] bears the number 808, indicating capture, Oct. 22, 1825, on the excursion from Rio into Minas Geraës. The detailed locality is given as "In a Roça (about 4 miles S.S.W. of the house of Disceoberto) on the road towards Nepomucena." The single specimen captured is named "*Lycus*." The dates and localities of the other specimens are respectively:—[15] Feb. 9, 1826, by the River Pacaqué, Organ Mountains; [16] Feb. 21, 1826, Organ Mountains; and [17] Jan. 15, 1827, Cubatão, "given by Thomas Smith."]

18, 19. —, var. α : elytris flavis, fasciæ dorsali interrupta apiceque late nigrescentibus (Bourg. loc. supr. cit. p. xvi). 2 ♀.—Brésil, Cubatão.

[18. Dec. 8, 1826. "Cubatão, at the Rio das Pedras at

the Citio (where I resided) at the foot of the ascent up the great range of mountains."

19. Jan. 15, 1827. "At Rio das Pedras and Cubatão."]

20. *brasilense*, var. γ : elytris fusco-nigris, fascia transversa obsoleta, saepius interrupta pone medium flava, humeris vix flavescens; abdomine omnino nigro (Bourg. *loc. supr. cit.* p. xvi). 1 ♀.—Brésil.

[Nov. 2, 1825. Excursion into Minas Geraës, "at Francisco Manoel's."]

21. *serratum*, L., 1 ♀.—Brésil.

[The specimen bears the date "27. 6. 29." On June 2, 1829, Burchell was at "Sitio das Pedras," on the Rio Tocantins, a little above Pará.]

22. *limbatum*, F., var. *affine*, Luc. (nec Taschenb.), 1 ♀.—Brésil, Cubatão.

[Dec. 8, 1826. See no. 18.]

23. *sextivittatum*, Taschenb., Giebel's Zeits. 1874, p. 96. 1 ♂—Brésil, Organ Mountains.

[Feb. 15, 1826. "Along the road $1\frac{1}{2}$ mile S. of the house." Evidently near the River Pacaqué in the Organ Mountains.]

CELETES, Newm.

24. *Burchelli*, sp. n., 1 ♂.—Brésil, Cubatão.

♂. *Elongatus*, subparallelus, sat dense tenuiter pubescens, vix nitidus; capite brunneo, mandibulis palisque testaceis, oculis maximis, valde prominentibus, nigris; fronte concavata; antennis brunneis, articulo secundo minimo, transverso, testaceo, sequentibus, a tertio inde, flabellum compressum, articulum ipsum longitudine multo superantem, a basi emittentibus, ultimo compresso, elongato-elliptico, præcedente duplo longiori; prothorace trapeziformi, parum transverso, antice attenuato, medio longitudinaliter carinato, ochraceo-flavo, disco fuscescens, margine antico medio angulato-lobato et utrinque sinuato, lateribus sat coarctatis, angulis anticis bene distinctis, posticis extrorsum valde productis, apice subacutis; scutello subquadrato; clytris basi latitudine thoracis, apicem versus paululum dilatatis, subparallelis, brunneis, humeris fasciaque transversa mediana ad marginem dilatata ochraceo-flavis, 4-costatis, costis 2 et 4 multo elevatioribus, intervallis costarum a

clathris transversis quadrato-areolatis: corpore subtus brunneo, trochanteribus femorumque summa basi genibusque flavescens. Long. 6 mill.; lat. 2 mill.

[Captured at 10 P.M. on Dec. 18, 1826, between the "Middle Part of the ascent up the" Sierra da Cubatão and the "Upper Part" of the same ascent.]

PLATEROS, Bourg.

25. *apicalis*, Germ., 1 ex.—Brésil, Minas Geraës, near Nepomucena.

[Nov. 3–6, 1825. See above, page 2. On 3rd and 4th at Francisco Manoel's, 5th at João Alfonso's, 6th at Capitão Leite's. "On the 3rd took a stroll up the hill to a Roça and got many insects." "4th . . . ascended the hill into the forest northward of our Rancho and took insects, till wet through in a thunder shower. In the evening caught some insects by the candle."]

26. *varicostatus*, sp. n., 1 ♀.—Brésil, Minas Geraës.

Subparallelus, supra fere planatus, subopacus, tenuissime pubescens, nigro-fuscus, prothorace antice et lateraliter sat late flavo-marginato, trapeziformi, basi longitudine paullo latiore, antice subrotundato, basi utrinque sinuato, lateribus fere rectis, angulis anticis sat bene distinctis, posticis extrorsum versus paulum prolongatis, subacutis, disco postice longitudinaliter canaliculato, antice carinulato; elytris 9-costatis, costis inæqualibus, alternis (præsertim 4, 6 et 8) magis elevatis, sexta a medio inde attenuata, intervallis costarum a clathris transversis punctato-areolatis; corpore subtus nitidiusculo, tenuiter pubescente, fusco, trochanteribus femorumque summa basi rufescentibus; abdominis segmento ultimo ogivali (♀).

Long. 7 mill.; lat. $2\frac{1}{2}$ mill.

Espèce voisine de *P. inæqualis*, Bourg. (Ann. Soc. ent. Fr. 1899, p. 99), mais de coloration différente.

[Oct. 23, 1825. "*Lampyris*." At Discoberto, Minas Geraës.]

Lampyrididæ.

HYAS, Cast.

27. Sp.?, 1 ♀.—Brésil, Minas Geraës.

[Oct. 21, 1825. "*Lampyris*." "In a rossa at Discoberto and along a channel (on the margin of the forest) which conducts water to the house."]

CLADOSES, Solier.

28. *lamellicornis*, Mots., 1 ♂.—Brésil, Rio.

[Jan. 1, 1826. "Catéte and Práia de Flaméngo.]

ÆTHRA, Cast.

29. *maledicta*, Ern. Oliv., Ann. Soc. ent. Fr. 1888, p. 79
(*lateralis*, Cast., nec Guér.-Ménev.). 1 ♂.—Brésil,
Cubatão.

[Dec. 9, 1826. "At Rio das Pédras ; in the Forest."]

LUCIDOTA, Cast.

30. Sp.?, 1 ex.—Brésil, Minas Geraës.

["*Lampyrís*." Oct. 25, 1825. "At Discoberto, near
João Pedro's house."]

31. Sp.?, 1 ex.—Brésil, Minas Geraës.

["*Lampyrís*." Oct. 16, 1825. On the previous day
Burchell was "at the Discoberto do Antonio Velho."]

PHOTINUS, Cast.

32. Sp.?, 1 ex.—Brésil, Minas Geraës.

["*Lampyrís*." Oct. 16, 1825. See no. 31.]

33. Sp.?, 1 ex.—Brésil, Organ Mountains.

[Feb. 12, 1826. "By the River Pacaquê."]

34. Sp.?, 1 ex.—Brésil, S. Paulo.

[June 19, 1827.]

- 35, 36. Sp.?, 2 ex.—Brésil, Minas Geraës.

["*Lampyrís*." Oct. 13, 1825. On Oct. 12 Burchell was
at Parahíba.]

CRATOMORPHUS, Mots.

- 37-40. *giganteus*, Drury, 4 ex.—Brésil, Cubatão.

[1826 [37], Dec. 6, "at Mr. Eric Smith's sitio at Rio das
Pédras"; [38] 7 P.M. Dec. 7th, probably the same locality
[39, 40] Dec. 10, "Rio das Pédras," 2 examples.]

41. ? *concolor*, Perty, 1 ex.—Brésil, Pará.

[Jan. 25, 1830.]

ASPIDOSOMA, Cast.

- 42-52. *lineatum*, Schönh., 11 ex., dont l'un avec la mention manuscrite: "luce intermittente."—Brésil.

[The dates and localities of the specimens are as follows:—

42, 43. Dec. 29, 1825 (2 examples). From Rio de Janeiro to Catombí, Barra Vermêlha, and Rio Comprido.

44. Jan. 26, 1826. Rio de J. "A botanical and entomological excursion to the Barra Vermêlha, Morro de Ladeira, and Catombí."

45. April 19, 1829. Porto Real (now Porto Nacional).

46. June 18, " Pará.

47. Aug. 21, " Pará, S. José.

48. Sept. 1, " " " [arsenal].

49. Sept. 2, " " " (between S. José and

50. Sept. 19, " " "

51. Nov. 14, " " "

52. Jan. 11, 1830. Pará. "Luce intermittente."]

53. ? *cassideum*, Mots., 1 ex.—Brésil.

[Pará, Jan. 21, 1830, 9 P.M.]

54. ? *impressipenne*, Mots., 1 ex.—Brésil.

[Feb. 11, 1826. Organ Mountains, "in a walk to the Ipé trees."]

55. Sp.?—Brésil.

[Santos, Sept. 28, 1826, 7 P.M.]

- 56-61. *roseiceps*, Bourg., Revue d'Entom. 1884, p. 286 (décrit par erreur de Nouvelle-Calédonie).—Brésil, 6 ex.

[56. Jan. 1, 1826. Rio. Catété and Práia de Flaméngo.

57. Sept. 20, 1826. Santos. In the Forest above the Monastery of S. Bento. "*Lampyrus*: the common sort flying in the evenings: and its larva, also giving fits of light." One of these larvæ [57 A] captured by Burchell on the same day, Sept. 20, is also in the collection.

58, 59, 60. Sept. 28, 1826, 7 P.M. (3 examples). Santos.

61. Nov. 26, 1826. Santos.

57 A. Cette larve rappelle, par sa forme générale, celle de l'*Aspidosoma candelarium*, Reiche, décrite et figurée par Goureau dans les 'Annales de la Société entomologique de France,' 1845, pl. 7. ii. figs. 1-6; mais elle en diffère (autant, du moins, qu'il est permis d'en juger sur un exemplaire piqué et déjà vieux) par le premier arceau thoracique

un peu plus allongé et plus atténué en avant, ainsi que par les 2^e et 3^e plus grands, sensiblement plus longs que les suivants. Les tubercules stigmatifères des côtés des segments abdominaux ne sont pas saillants comme dans la figure citée ci-dessus, mais cela tient sans doute à l'état de dessiccation de cette larve. Quant aux pattes, elles sont conformées de même, frangées de quelques soies à leur bord interne et terminées par un double crochet.—Long. 9 mill.; larg. max. 2½ mill.]

62. Sp.?—Brésil.

[Rio, Aqueduct. March 12, 1826.]

63. Sp.?—Brésil, Minas Geraës.

[Oct. 25, 1825. At Discoberto, near João Pedro's house. "*Lampyrus*?"]

LAMPYRIS, L.

64-66. Sp.?, 3 ♂.—Afrique australe. *L. conspicua*, Gyll., vicinus, sed scutello abdomineque flavis.

[No. 92 [64], "6. Dupl. L L," was captured at 8 P.M. on Oct. 3, 1814, at Sylvan Station, north of George. Leach considered it as possibly the same form as that figured by Olivier ("pl. i. f. 5b?"), and Burchell suggested the name "*sylvatica*, B." In his Olivier Collation Burchell noted the same resemblance as follows:—"92. *Lampyrus mauritanica* quoad figuram (Genus 28, Tab. i. fig. 5b) sed fig. 5a est valde diversa."

The second specimen [65] bears only the date 3. 10. 14 (when Burchell was at "Sylvan Station"), with the figure 7 and the letter L, probably indicating that 7 *Lampyrus* (no. 92 and 6 duplicates) were taken on this date.

The third specimen bears the no. 93 [66], and was captured at 8 P.M. Sept. 2, 1814, at Sylvan Station. "Vespere ad lucernam volabat. Elytra antennæ oculi et pedes nigra. Reliquæ partes pallide flavæ. 1 Duplic." (Catalogus.) The Banksian Collation contains the note "93. Lamp. aff. *Lamp. flabellico* statura et forma, cui thorax fusco-niger."

See also the last paragraph under the head of *Luciola coffræ* (p. 29), where an accidental interchange of Burchell's no. 93 with his 88 is mentioned.]

AMYTHETES, Illig.

67-71. *apicalis*, Germ., 5 ♂.—Brésil, Rio de J.

[Sept. 15, 1825. Along the Aqueduct (from Sta. Therésa

to the ridge above the valley of Laranjeiros). Five specimens are mentioned in the "notes," with the following remarks:— "*Lampyrís (Lycus)*. Antennæ uno latere latissime pectinatae nigrae. Elytr. rufescentia, apicibus nigris. Ex sylvaticis herbosis. Noctu valde luccens."]

72. Sp. ?, 1 ♂.—Brésil, Pará.

[Dec. 15, 1829, 12 P.M.]

MEGALOPHTHALMUS, Gray.

73-78. *ptiliniiformis*, sp. n., 6 ♂.—Brésil, Pará.

♂. Oblongus, pallide fusco-griseus, flavido pubescens; capite fusco, mandibulis palisque testaceis; oculis nigris; antennis articulo primo flavo, sequentibus infuscatis, ramulis pallidis, immaculatis; prothorace rugoso-punctato, transverso, trapezoidali, margine antico leviter rotundato, lateribus fere rectis, subparallelis, basi sat profunde bisinuata, angulis posticis leviter productis, disco infuscato, levissime carinulato, pone medium tuberculis 2 sat elevatis, glabris, nitidiusculis notato; elytris basi paulo dilutioribus, rugoso-punctatis, singulatim 3-costatis, costa prima pone medium evanescente; pectore flavo, abdomine nigro, segmentis ventralibus 5 et 6 albido-cereis; pedibus pallide fuscis.

Long. 5 mill.

Voisin de *M. obscurus*, Ern. Oliv. (Ann. Soc. ent. Fr. 1895, p. 146), dont il diffère surtout par la première côte élytrale abrégée postérieurement.

Je lui conserve le nom inédit sous lequel l'avait désigné Westwood.

[73. Dec. 28, 1829. Pará. This specimen bears a label in the handwriting of Professor Westwood, "*ptiliniiformis*, Westw., sp. nov."

74, 75, 76. Jan. 11, 1830, 8 P.M. Pará (3 examples); two of these bear the number "1454," a reference number of which the meaning was contained in an "8^{vo} (long) red-coloured volume" which did not reach Oxford. "This red vol. has not been found, J. O. W." is appended in pencil by Prof. Westwood to Burchell's allusion to it. The last entry in the "Brazilian notes" deals with the number 1345, for March 18th, 1829; so that the missing volume contains Burchell's recorded observations between this date and Feb. 10th, 1830, the day he sailed from Pará. The localities are fortunately preserved in the "Index."

77. Jan. 13, 1830, 8 P.M. "1454." Pará.

78. Jan. 24, 1830. "1454." Pará.]

LUCIOLA, Cast.

79-82. Sp.?, 4 ♂.—Afrique australe. *L. caffræ*, Bohem., similis, sed major, pronoto dense reticulato-punctato, medio longitudinaliter late nigro-fasciato.

[Four specimens bear Burchell's nos. 88 [79], 89 [80], 90 [81], 91 [82]. They were captured, with "13 Duplic. LL," at 7.30 P.M. on Oct. 6, 1814, at Nowsakamma River, Mossel Bay. "Abdominis pars alba lucem reddit. v. J." (Catalogus). The reference is evidently to an undiscovered Journal of South-African travel. Leach considered the species new, and Burchell suggested the name *uliginaria*, B., for it, but in his Banksian Collation doubtfully sets it down as "*Lampyris marginata*?"

Burchell's nos. 88 and 93 (see p. 27) had been accidentally interchanged, but the mistake is so evident that the original numbering has now been restored.]

PHOTURIS, Le Conte.

83. *mæsta*, Germ., 1 ♀.—Brésil, Minas Geraës.

[Oct. 28, 1825. In the Forest on the West and on the East side of S. João de Nêpomucéna.]

84, 85. *fruticola*, Mots., 2 ex.—Brésil, Rio de J.

[84. March 16, 1826. In the upper part of the valley of Catombi, and along the road thence to Rio Comprido and Matto Porcos.

85. April 9, 1826. "*Lampyris*. About the middle of twilight, these begin to fly in great numbers about meadows and bushy places; they are not seen for more than about an hour."]

86, 87. *lineola*, Blanch., 2 ex.—Brésil.

[86. Dec. 9, 1826, 8 P.M. At Rio das Pedrás; in the Forest, Cubatão.

87. March 2, 1829. Porto Real (Nacional). The specimens are numbered 1334. The following notes refer to them:—

"1334. *Lampyris*. Probably the same species as 1330 [see below]. It is common here, in certain nights or states of the weather, and perhaps at least foretells fair weather for that night. Its light is at intervals, and only (as in all the genus) when flying. When taken it emits and withdraws its light much more rapidly; as [it] seems as if the effect of

breathing, whereas in flying the light and dark intervals are both much longer (abt 5 seconds more or less). 2. 3. [29]."

Burchell had captured what he took to be the larva of *P. lineola* on March 1, 1829, in his garden at Porto Real. The following note refers to it.

"1330. Larva of (*Lampyris*?). Caught in the garden crawling on the ground at night, and detected by means of a small spot of light at the head; but on being touched it instantly emitted a much stronger light from every part or joint of the abdomen which previously was quite dark. The light proceeded only from the underpart: the back was dark at all times. 1. 3. [29]."

The sudden increase of light which follows disturbance strongly supports A. R. Wallace's interpretation of the luminosity of glow-worms as aposematic.

The specimen has been found and submitted to Mr. C. O. Waterhouse, who considered that the appearance and structure conformed more to the Elaterid than to any other type, but that the notes of habits suggested a Lampyrid.]

88. Sp.?, 1 ex.—Brésil, Minas Geraës. Sat magna, elongato-elliptica, prothorace flavo, elytris fusco-nigris, anguste (quadrante apicali excepto) albido-limbatis.

[Oct. 26, 1825. At Discoberto; near João Pedro's house. "*Lampyris*."]

Cantharididæ.

CHAULIOGNATHUS, Hentz.

89-91. *fallax*, Germ., var., 3 ex.—Brésil, Minas Geraës.

[89. Oct. 22, 1825. "In a Roça (about 4 miles S.S.W. of the house of Discoberto) on the road towards Nepomucena. *Lampyris*."

90. Oct. 30, 1825. (In the forest) on the N.E. side of the arraial of São João de Nepomucena.

91. Nov. 3-6, 1825. See no. 25, p. 24.]

92. Sp.?, 1 ♂.—Brésil, S. Paulo. [Feb. 2, 1827.]

93. Sp.?, 1 ♀.—Brésil, Porto Real (Nacional).

[Jan. 11, 1829. "*Staphylinus*. Caught on the ground at the back door, probably where it was attracted by animal substances." This label may have been accidentally transposed.]

94. Sp.?, 1 ex.—Brésil. [Feb. 8, 1826. "Organs Mts. (in a ride to the Cattle Pounds and the Milho Roça)."]
95. Sp.?, 1 ex.—Brésil, Minas Geraës. [Nov. 3-6, 1825. See no. 25, p. 24.]
96. Sp.?, 1 ex.—Brésil, Organ Mountains. [Feb. 18, 1826, 9 P.M.]

CANTHARIS, L.

- 97, 98. *viridescens*, F., 2 ex.—Afr. australe.

Le Catalogue de Munich indique par erreur *viridescens*, F., comme synonyme de *smaragdula*, F., espèce brésilienne qui a avec la première une certaine analogie de coloration, mais en est néanmoins bien distincte.

[Both these specimens bear a V, of which the meaning is as follows, in Burchell's words:—"Sent to me by Villet as Cape Insects, and were received at Fulham during my absence in Brazil" (Catalogus).]

99. *bivittata*, F., Syst. Eleuth. i. 1801, p. 302, 1 ex.—Afr. australe. (Omis au Catalogue de Munich.)

[No. 95. Captured Dec. 27, 1813, between Bethelsdorp and Uitenhage, Cape Colony, "in mimosa v. H." [=vide Herbarium]. Burchell puts only *Telephorus* in the Catalogus. In the Olivier Collation we find "95. *Telephorus*?? similis *Lampyro vittatæ*."]

100. Sp.?, 1 ex.—Brésil, Minas Geraës. [Oct. 28, 1825. See no. 83, p. 29.]

- 101, 102. Sp.?, 2 ex.—Brésil.

[101. Feb. 12, 1826. Organ Mountains. By the River Pacaqué.

102. Nov. 8, 1828, 10 P.M. Córrego Raiz. Between Chapáda and Porto Real (Nacional).]

DISCODON, Gohl.

Biol. Centr.-Amer., Coleop. iii. 2, p. 78.

- 103, 104. *cinctus*, Cast., 2 ex.—Brésil, Minas Geraës.

[103. Oct. 23, 1825. Discoberto. "*Lampyris*."

104. Nov. 1, 1825. Near Nepomucena.]

105. Sp.?—Brésil, Cubatão. [Foot of Sierra, Dec. 14, 1826, 9 P.M.]
106. Sp.?—Brésil, Organ Mountains. [Feb. 12, 1826. By the River Pacaqué.]
107. Sp.?—Brésil [Minas Geraës. Oct. 16, 1825. At Discoberto on 15th.]
- 108, 109. Sp.?, 2 ex.—Brésil [Organ Mountains. Feb. 12, 1826. River Pacaqué.]

DAIPHIRON, Gorh.

Biol. Centr.-Amer., Coleop. iii. 2, p. 66.

110. Sp.?—Brésil [Minas Geraës. Oct. 14, 1825. At Parahíba on 12th. Discoberto on 15th. "*Lampyrís*."]

Melyrididæ.

HEDYBIUS, Er.

111. ?*oculatus*, Thunb., 1 ♀.—Afr. austr.

[No. 96. "*Malachius*." The origin of the specimen is given in the only other word in the Catalogus, viz. "Bouch." This indicates "From Mr. Bouchenroeder's collection at Cape Town (115 insects), of which perhaps some may not be African at all: and it would therefore not be safe to admit them without careful examination into my Cape Fauna."]

[The collection also contains two Lampyrid larvæ in addition to 57 A:—

112. July 11, 1827. S. Paulo. The specimen bears the number 1211, referring to the following note, which is accompanied by a slight sketch:—"1211. *Lampyrís*. Two luminous spots on the same ring at the hinder part of the abdomen. It crawls with its feet, but assists with the tail by bending it under in the manner of some caterpillars, and resting the point on the ground as a fulcrum pushes on the body forwards. 11. 7. [27]."
113. July 26, 1829. Pará. The larva is numbered 1402, referring to a record in the lost note-book.]

3 D

IV. *On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825-1830.* By CORA B. SANDERS, of Lady Margaret Hall, Oxford.

[Plate III.]

IN the course of the identification and arrangement of the large collection of butterflies in the Hope Department the Burchell specimens fell into their places in the various groups. Every fragment has been retained, even when the series of individuals was a very long one, because of the historic interest which attaches to the carefully preserved data. The identification and arrangement are the careful work of Mr. W. Holland, and in cases of special difficulty I have taken the specimens to London for comparison with those in the Godman-Salvin Collection and the British Museum. In making out many of the most puzzling species of that difficult subfamily the Ithomiinæ the late Mr. Osbert Salvin, F.R.S., very kindly gave me the invaluable help of his intimate knowledge and long experience. Dr. F. D. Godman, F.R.S., has similarly come to my aid with the most difficult of the Satyrinæ, and has also promised to name the whole of the Burchell specimens in the group upon which he is so distinguished an authority—the Hesperiidæ. Kind help has also been afforded by Mr. F. A. Heron, of the British Museum. When the arrangement of the Rhopalocera was sufficiently advanced I suggested to Miss Sanders that it would be of much interest to prepare an account of the Burchell specimens, incorporating all the data and observations recorded on the specimens and in the note-books. As I have explained above, Miss Sanders is not responsible for the identification of the species, although she has taken specimens to London to compare them afresh when it appeared possible that there might be some slight difference between them and the individuals captured in more recent years. For such possible differences Miss Sanders has kept the keenest outlook, aided in the search by Mr. Holland and myself; and it will be seen that the quest has not been altogether fruitless. The explanation of any recognizable differences, as due to a genuine change of form in three quarters of a century or to alteration in the distribution of forms, will be considered in each case as it arises. It may be said, however, that the evidence of some change is

greater than we ventured to hope for at the outset of the enquiry.

I have claimed that the Burchell Collection, with its numberless accurate data, is of the highest historic importance in enabling us to carry back "the detailed record of the occurrence of many thousands of species in two most interesting parts of the world, and to construct a trustworthy standard by which to measure the rate of future change" (see I., Introduction, page 2). The trustworthiness of the standard depends upon the persistence of the data unaltered from Burchell's time to this. There is, fortunately, the means of checking these data by comparison with a list of the Brazilian Arthropoda made under Professor Westwood's direction during the years which immediately followed the gift of the collection in 1865. A second list of the dates of every individual of a species in Professor Westwood's handwriting is found on one specimen of many species, and this has often been a valuable check upon the complete list when errors were suspected.

The first section of the butterflies is written in Professor Westwood's own handwriting, and deals with the Heliconiidae in the old broad sense, comprising the Ithomiinae, the genera *Lycorea* and *Ituna* of the Danainae, and the Heliconiinae. Although in the form of rough notes and very difficult to disentangle, it is a model of accuracy. It records the whole of Burchell's notes written on the labels accompanying the specimens, but apparently none of the facts to be found in his manuscript note-books. Beyond the Heliconiidae the list of butterflies is continued in an extremely clear handwriting, with great neatness of arrangement, but containing occasional slips and mistakes which can be detected by careful comparison with the existing data. It is evident that Professor Westwood arranged the vast mass of material into groups and sub-groups, and in each of these separated the forms into what he believed were distinct species. An assistant employed under his direction then copied the notes written by Burchell on the labels attached to each specimen. In some cases Westwood himself added names to the forms thus grouped together in the list; but in the vast majority of cases the list remains as it was written by his assistant. My inference from the handwriting has been kindly confirmed by my friend Miss Swann, who tells me that her uncle, Professor Westwood, employed an assistant to write for him about the time at which these lists were copied. The backs of old University Notices were employed for this purpose, and a rather valuable record of the acts of the University during some of the years

before the appearance of the 'Gazette' is to be found on the reverse sides of the sheets!

A few Notices of the years 1864, 1865, and 1867 are thus employed, together with large numbers issued in 1866 and 1869. A single paper with the date 1871 is made use of. It is therefore almost certain that the list was begun at once and finished within about six years of the gift. My first experience of the Department was in the summer of 1873, and I feel sure that the work was not going on then and was not resumed at a later date. Professor Westwood was keenly interested in the collection and appreciated it at its true worth. About 17 months after its arrival in Oxford he had already made a preliminary survey, and, on Nov. 26th, 1866, gave an account of it to the Ashmolean Society. The 'Proceedings' of this Society are very rare, and I have thought it well to reprint the passages in which the collection is described and its great significance demonstrated.

"On the Data afforded by the Burchellian Collection as to the Geographical and Modificational Ranges of certain Brazilian Insects. By J. O. WESTWOOD, M.A., F.L.S., Hope Professor of Zoology.

['Proceedings of the Ashmolean Society,' New Series, No. I.
Read Monday, Nov. 26th, 1866.]

"Professor Westwood gave an account of the very extensive collections in various branches of zoology formed in South Africa and Brazil by the late Dr. W. J. Burchell, and presented to the University of Oxford by his surviving sister, in recognition of the honour conferred on her brother by the degree of D.C.L. some years previously. The collection was extremely rich, both in the number of species and also of individuals, and was especially valuable from the great care which had been taken in attaching the date of capture to every specimen, whereby, in conjunction with the journal kept by Dr. Burchell, the amount of geographical range and modification change of each species could be accurately determined. The Brazilian portion of the collection had been made during a visit extending over three years [in reality nearly five years], in which period Dr. Burchell investigated the natural history of Rio Janeiro and its neighbourhood, thence proceeding southwards to Santos and San Paulo, thence north-westwards to Goyaz, and thence due north by the Tocantins to Para and its neighbourhood. Copious note-books were kept, and entries made daily, so that it may safely be affirmed that in respect to its geographical data no collection equal to this has ever reached Europe. The donation of the collection

to the University was also very opportune at the present moment, when the question of the existence of species, and the extent of variation to which they are subject, are especially attracting the attention of zoologists."

After giving an account of the views of various writers on these questions and expressing his own belief "in the independent and original creation of species," Professor Westwood concluded as follows:—

"A careful study of the Burchellian collection required to be made, and it could not be doubted that it would afford satisfactory data for ascertaining the specific status of many of the insects which had fallen under Dr. Burchell's notice."

It is a keen pleasure to me to realize that in gradually publishing an account of the Burchell Collection I am carrying on a work to which my great predecessor devoted so much time and thought.

A search through Burchell's manuscript brought to light a scrap of paper covered with figures which tell us much of the man and his work. It is a memorandum of the dates at which he unpacked each section of his immense collection of insects and relaxed and set out the specimens. The majority of the dates refer to the "Lepidoptera &c.," and these are reproduced below:—

"Lepidoptera &c. relaxed and put out.

[Specimens captured between following dates.]				Relaxed and set out [between following dates].			
7.	9. 28	to	28. 2. 29	[Set]	26. 12. 39	to	8. 1. 40
28.	2. 29	"	29. 4. 29	"	9. 1. 40	"	3. 2. 40
30.	4. 29	"	5. 2. 30	"	2. 2. 40	"	9. 4. 40

Lepidoptera &c. relaxed and put out from the Cedarwood Box
containing [captures] from 20. 7. 27 to 16. 4. 28.

25.	8. 27	to A.[M.]	29. 8. 27	[Set]	12. 2. 44	_____
6.	8. 27	"	26. 8. 27	"	6. 4. 46	to 30. 4. 46
11.	2. 26	"	14. 2. 26	"	30. 4. 46	" 20. 6. 46
27.	1. 26	"	9. 2. 26	"	29. 6. 46	" 22. 7. 46

Lepidoptera of Rio de Janeiro, Minas, &c., &c.

27.	1. 26	to	8. 2. 26	[Set]	24. 7. 46	to	28. 7. 46
			27. 1. 26	"	28. 7. 46	"	31. 7. 46
14.	1. 26	"		"	[31. 7. 46]	"	1. 8. 46
31.	12. 25	"	14. 1. 26	"	1. 8. 46	"	5. 8. 46
6.	12. 25	"	31. 12. 25	"	6. 8. 46	"	10. 8. 46
7.	11. 25	"	6. 12. 25	"	11. 8. 46	"	14. 8. 46
4.	11. 25	"	6. 11. 25	"	15. 8. 46	"	19. 8. 46
7.	11. 25	"	6. 12. 25	"	20. 8. 46	"	21. 8. 46
29.	10. 25	"	4. 11. 25	"	21. 8. 46	"	22. 8. 46
999]	27. 10. 25	"	29. 10. 25	"	22. 8. 46	"	8. 9. 46
819]	23. 10. 25	"	998]	27. 10. 25	"	8. 9. 46	" 23. 9. 46

N.B.—Finished putting out and unpacking the whole of my Brazilian Insects on 26. 9. 46."

This mechanical labour was therefore completed when Burchell was about 63 years of age, 16½ years after the Brazilian journey came to an end in February 1830.

It is hardly necessary to add that the specimens were set in our old insular style, sloping and low upon the pin. Nearly all the butterflies have now been reset in accordance with modern requirements.

Burchell's method of keeping his notes on the Arthropoda was changed as time went on. At first he sorted out the captures of each day into what he believed to be species, and gave a list of these, and, in another column, the number of individuals belonging to each. Opposite these numbers observations of habits were sometimes recorded. During his journey to Rio, between April 2 and July 6, 1825, he had captured 97 kinds, distinguished by the numbers 1-97 (in Portugal, at Madeira, at Teneriffe, and on the ship). Between July 26 and Oct. 27, 1825, he had similarly distinguished species 98-1022 (during the earlier months of his residence at Rio and the greater part of his excursion into Minas Geraes). The labour was probably excessive and in the majority of cases served no specially valuable purpose; for the same work could be done better after his return home. Accordingly we find that he employed this method for the last time on Oct. 27, 1825, explaining a new meaning for all the numbers beyond 1022 in these words:—"N.B. The following Numbers are of such Insects *only* as require special and particular remark: of all the others their *locality* and *season* can be known only by referring to that same date in the Journal, or in the Catalogus Geographicus of the Botanical Collection: or to the following list of dates." The Journal is unfortunately lost, but the other two books are in the Hope Department, the second ("the following list of dates") being what I have called the "Brazilian note-book." In this latter the numbers 1023 to 1345 (Jan. 1, 1826, to March 18, 1829) occur among other entries which are distinguished by dates alone, and not by numbers. All the numbers beyond 1022 and some of the dates refer to observations made upon the living forms. The numbers of individuals are not given, but can sometimes be inferred from the descriptions. The last number 1345 refers to an observation made at Porto Real (Nacional) on March 18th, 1829; so that all the observations made during the descent of the Tocantins and at Pará, in fact from March 19, 1829, to Feb. 10, 1830, are lost, having been contained in the missing volume alluded to on page 23.

It is very satisfactory that an opportunity has been found for publishing the two Burchell note-books which are now at Oxford,—the "African Catalogue" and the "Brazilian Note-

book," both on account of their high intrinsic interest and because of the irreparable injury which their loss or destruction would inflict upon this historic collection. Another satisfactory consequence of their publication is the far higher value which attaches to the contents of the present volume, now that they are brought into relation with the whole of Burchell's original notes upon his collections of insects &c. This relationship is established by the dates on the specimens and by the reproduction of any of Burchell's reference numbers which are still to be found attached to the insects. The vast majority of these are, however, distinguished by their dates, and have no such numbers. The following example will serve clearly to distinguish between Burchell's reference numbers and those which are now added to bring the specimens into relation with the present volume:—

Bz. 907. *III.* + 25. 10. 25. 2 ♀ = 37, 38.

Burchell's reference number will be printed *before* the date of capture and in italics, while the numbers now added will always appear *after* the date and printed in heavy type. *Bz.* indicates that the date or number immediately following is an original label, written in Brazil. *III.* refers to the number of individuals recorded in Burchell's note-book as far as the number 1022. In this case two are accounted for by specimens 37 and 38, while the third label is to be found upon 40 under an allied species. The + indicates that the specimens also bear labels which were carefully written and added after Burchell's return to England. Examples are seen in the labels to the right of figs. 9 and 10 on Pl. III., where the Brazilian number is lowest. When *Bz.* is wanting, Burchell had copied the reference number and removed the original, as in the label accompanying fig. 11. *Bz.* without the + is used when the specimen bears only a Brazilian label (as in fig. 6). In all such cases as this the dates have been recovered from the Brazilian note-book. All the other figures on Plate III. are without Brazilian labels, and bear dates, sometimes accompanied by notes (figs. 5 and 8), carefully written after the return home; and this is true of the great majority of the specimens hereafter recorded, all, indeed, of which the dates are not preceded by italicized letters or numbers. In many cases the original Brazilian date was never copied and remains as the only label. Such dates are preceded by *Bz.*

I trust that these directions will enable the reader to ascertain at a glance exactly what records of the great naturalist accompany or refer to each specimen in the collection to which he devoted so large a part of his life.

E. B. POULTON.

Oxford, Jan. 25, 1904.

3 E

I. *ITHOMIINÆ*.*Heterosais edessa*, Hew.

16. 9. 26. 2 ♂ = 1, 2. Santos. "Close above the Monastery of São Bento." "Ad marginem Sylvæ."
 23. 9. 26. 4 ♂ = 3-6, 1 ♀ = 7. Santos. 3 and 7 bear Brazilian labels.
 26. 11. 26. ♂ = 8. Santos. "In the chácara (where I resided) near the Monastery of São Bento."

It has already been stated that the list of Ithomiinæ is in Professor Westwood's handwriting.

The determination and sexing of specimens 1-8 agree with Westwood's. His notes show that there were two more specimens which cannot now be found. Both were males and dated 12. 1. 26 (Rio) and 23. 9. 26 (Santos).

Hymenitis adasa, Hew.

- Bz. 693. I. 22. 10. 25. ♀ = 9. Minas Geraes. "In a Roça (about 4 miles S.S.W. of the house of Discoberto), on the road towards San João de Nepomucena." "*Pupilio*."

8. 2. 26. 3 ♀ = 10-12. Organ Mountains. Near head of R. Pacaquê. "In a ride to the Cattle Pounds and the Milho Roça."

Agrees with Westwood's notes except as regards 12. Concerning this specimen he had written "Very like *adasa*, but with diff. veins," and "Not in Hewitson Coll. or book." On 11 he had written in pencil "♀ agrees with *adasa* ♀ Hew. in its veins of h. w. but not with ♂."

Hymenitis erruca, Hew.

23. 9. 26. 2 ♂ = 13, 14. Santos.

Determined by Westwood as *polissena* ♂. On 13 he wrote seems identical with *Polissena* from Quito."

Pseudoscada sp. near *utilla*, Hew.

8. 2. 26. ♂ = 15. Organ Mountains. (As 10-12.)

Compared with Hewitson's specimens of *utilla* in the British Museum 15 appears to be a less heavily marked form of the same species.

Determined by Westwood as ♂ *acilla*.

Pseudoscada Jessica, Hew.

11. 2. 26. 2 ♂ = 16, 17. Organ Mountains. "By the River Pacaqué." "In a walk to the Ipé trees."

14. 2. 26. ♂ = 18. Organ Mountains. Near R. Pacaqué.

Agrees in all respects with Westwood's notes. Burchell's manuscript label was missing from 18. The date was recovered from Westwood's list.

Pseudoscada acilla, Hew.

4. 11. 25. ♂ = 19. Minas Geraes. Francisco Manoel's Rancho. Near Nepômucéna.

8. 2. 26. ♂ = 20. Organ Mountains. (As 10-12.)

9. 2. 26. ♂ = 21. " " "By the River Pacaqué."

Agrees in all respects with Westwood, except that 15 was also included under *acilla*.

Ithomia agnosia, Hew.

10. 11. 25. 3 ♂ = 22-24. Minas Geraes.

These three specimens were carefully compared with twenty-three in the Hope Department, one in the British Museum, and a series in the Godman-Salvin Collection, none, however, being from Brazil. A very few examples (one from Colombia) in the Godman-Salvin Collection occur approaching the Burchell form. The Burchell specimens vary from the usual form in having no extension of the black diagonal band on the fore wing into the interspace between the second and third median nervules, and a narrower marginal band on the hind wing. The general effect of the difference between these and the specimens mentioned above is that the transparent part of the wings is much more prominent in the Burchell examples. In fact the difference resembles that between *Leucothyris phenomoe* and its subspecies *Burchelli* (compare figs. 3 and 4 with 1 and 2 on Pl. III.), described on pp. 43, 44. In both cases South-East Brazil is characterized by a form in which the transparent area of the wings is increased at the expense of the black markings.

Agrees with Westwood's notes. He had written the words "*agnosia*, var.," on 22.

Ithomia phono, Hübn.

No data. ♀ = 25.

Bz. 196. I. 8. 9. 25. ♀ = 26. Rio Janeiro (along the Aque-duct). "*Papilio (Heliconius)* In Sylva."

852. *I.* + 24. 10. 25. ♀ = 27. Minas Geraes. "About João Pedro's at Discoberto: at the margin of the forest."
"Papilio."

10. 1. 26. ♀ = 28. Rio de Janeiro, Praia Grande, and vicinity.

14. 1. 26. ♀ = 29. Rio de Janeiro. Valley of Laranjeiros and about São João de Carahý at Laranjeiros.

11. 2. 26. 2 ♂ = 30, 31. Organ Mountains. (As 16, 17.)

Bz. 18. 3. 26. 2 ♂ = 32, 33. Rio de Janeiro. Along the Carioca Aqueduct.

16. 9. 26. 2 ♂ = 34, 35. Santos. (As 1, 2.) Brazilian label on 34.

Agrees in all respects with Westwood, save that as regards either 32 or 33 he had written "1 ♂ with v[cin] of H. W. abnormal."

Pteronymia hemixanthe, Feld.

Bz. 335. *II.* 15. 10. 25. ♀ = 36. Minas Geraes. "*Fap*[ilio]. At the Discoberto do Antonio Velho. In floribus *Liatrideæ albifloræ*."

907. *III.* + 25. 10. 25. 2 ♀ = 37, 38. Minas Geraes. "*F*[apilio]. At Discoberto, near João Pedro's house."

Specimens not sexed by Westwood. His determination agrees.

Pteronymia euritea, Cram.

Bz. 317. *I.* 14. 10. 25. ♂ = 39. Minas Geraes. Discoberto. "Horta."

Bz. 907. *III.* + 25. 10. 25. ♀ = 40. Minas Geraes. (As 37, 38.)

8. 11. 25. ♂ = 41. Minas Geraes. "*Sylvatica*."

8. 2. 26. 2 ♂ = 42, 43. Organ Mountains. (As 10-12.)

9. 2. 26. 2 ♂ ♀ = 44, 45. " " (As 21.)

11. 2. 26. 2 ♂ ♀ = 46, 47. " " (As 16, 17.)

14. 2. 26. ♀ = 48. " " (As 18.)

21. 2. 26. ♂ = 49. " " Near the R. Paçaqué, "along the road by the Rancho for 1½ mile from the house."

18. 3. 26. 2 ♂ = 50, 51. Rio de Janeiro. (As 32, 33.)

Bz. 26. 11. 26. ♀ = 52. Santos. (As 8.)

[The fact that the two closely similar species, *hemixanthe* and *euritea*, are to be found flying together is of much interest. Their remarkable resemblance in the fresh state is well shown by the inability of this acute observer to discriminate between them. Thus no. 907 was found upon two specimens of the

first-named species (37 and 38) and upon one of the last-named (40). But the group also includes another less nearly related species which Burchell failed to separate. The number 335 is found upon *P. hemixanthe* (36) and *Heteroscada yanetta* (130), indicating that they were taken for the same species on the same day visiting the same flowers, accompanied by *Pteronymia sao* (53) and *Dircenna dero* (67, 68), both of which were recognized as distinct. Furthermore, in the note-book we find the numbers "335 . . . (317)," indicating a second time that the latter, *P. euritea* (39), was considered to be the same as *hemixanthe*, and, in this case, the same as *H. yanetta* also.

Burchell was able to penetrate the disguise of other examples of mimicry, such as the resemblance of certain Hemiptera for the Hymenoptera; but in the remarkable synaposematic likeness between the nearly allied species of Ithomiinæ there was nothing to arrest his attention.—E. B. P.]

Specimens not sexed by Westwood. His determination agrees. He gives the dates of six additional specimens of *euritea* which cannot now be found. One of these bore the same date as 42, 43, two the same as 44, 45, one the same as 48. One was dated 4. 11. 25 (Minas Geraes, near Ncpomucena, Francisco Manoel's. The notes show that the specimen might have been captured by "some tropeiros from the rancho"). One was dated 31. 12. 25 (Rio; on the Corcovado Mountain, and in the Valley of Laranjeiros).

Pteronymia sao, Hübn.

Bz. 338. I. 15. 10. 25. ♀ = 53. Minas Geraes. "Pap[ilio] cum 335." (As 36. The whole note applies to 53.)

Agrees in all respects with Westwood's notes.

Pteronymia nr. artena, Hew.

8. 2. 26. ♀ = 54. Organ Mountains. (As 10-12.)

14. 2. 26. ♂ = 55. " " (As 18.)

Compared with Hewitson's type of *artena* in the British Museum, 54 and 55 appear to be a less heavily marked form of the same species.

On 55 Westwood had written "*artena* but with only a minute white stigma instead of a larger 4-patch," and as regards 54 a difference in venation is alluded to and explained by reference to a rough diagram. The sexing agrees.

Pteronymia sylvo, Hübn.

12. 11. 25. ♂ = 56. Minas Geraes. "At Maudioca."

cent. greater than in *phenomoe*. Furthermore, in the former, but not in the latter, the band is continued in a much narrower form along the second median nervule until it joins the black hind marginal border near the anal angle of the wing. The development of this important marking gives it a different shape, the proximal border being markedly concave in *phenomoe*, straight or slightly convex in *Burchelli*, the concavity of the distal border being more pronounced in *Burchelli*.

The type of *Burchelli*, specimen 64 from the junction of the Rio Araguay with the Rio Tocantins, is represented in Pl. III. fig. 1.

Distribution (based on the specimens in the Godman-Salvin Collection and the Hope Department).—*Burchelli* occurs in the northern part of Eastern Brazil, *phenomoe* in the southern part, in Argentina, and Venezuela.—E. B. P.]

On specimen no. 65 there is a scrap of paper on which Professor Westwood had written in pencil "Like *phenomoe*, but larger black band. [? is it a] black var." There is uncertainty as to the correct interpretation of the letters enclosed in square brackets. On 63 he had written a list of the dates of specimens 60-65, and opposite 19. 5. 29 are the words "2 ind. fascia longiori." In his list of Heliconiidæ the words are "2 ind. fascia ad apicem cellulæ magis elongata." There is also a statement that he submitted a specimen to Hewitson, who probably suggested the name "*flora* black var.," which has been added in pencil. These butterflies were carefully compared with others in the Hope Department and the Godman-Salvin Collection, and it was found that this heavy type of marking is probably characteristic of a large section of the northern part of Eastern Brazil, for two similar forms captured by the late T. Belt in Maranhão exist at Oxford, while the Godman-Salvin Collection contains one similar form from Pernambuco and one from Bahia. The latter collection also contains eight specimens from Argentina, one from Rio, and a series from Venezuela. All these, together with the Burchell specimens from South-East Brazil (nos. 60-63) and two Miers specimens (probably Rio) at Oxford, are of the ordinary form, with lighter markings, as also are six specimens in the British Museum, which, however, are without localities.

Dircenna hulda, Feld.

31. 1. 26. ♀ = 66. Rio de Janciro. "Valley of Catombí and a high mountain on the N.W. side of the Aqueduct."

"All of this date were from off plants, mostly up the Valley of Catumbí."

The specimen was named by Westwood *epidero*.

Dircenna dero, Hübn.

Bz. 340. II. 15. 10. 25. 2 ♀ = 67, 68 (Pl. III. fig. 6). Minas Geraes. "*P[apilio]* cum 335." (As 36, and taken with it "in floribus *Liatrideæ albifloræ*.")

Bz. 475. II. 16. 10. 25. 2 ♀ = 69, 70. Minas Geraes. Discoberto. "*Papilio*."

Burchell wrote "475 ... (340)" in his Brazilian note-book, indicating his recognition that the four specimens 67-70 belonged to the same species.

Bz. 546. I. 18. 10. 25. ♀ = 71. Minas Geraes. Discoberto. "*Papilio*."

28. 10. 25. ♀ = 72 (Pl. III. fig. 7). Minas Geraes. "In the Forest on the West and on the East side of S. João de Nêpomucéna."

29. 10. 25. ♀ = 73. Minas Geraes. "In the Forest on the S.E. side of S. João de Nêpomucéna."

1. 8. 27. ♂ = 74 (Pl. III. fig. 5). Near S. Paulo: on road between Jundialy and Capivary. "Iter faciêdo."

Burchell's manuscript labels are reproduced to the right of the three figures on Pl. III. (5-7) to which they respectively refer. That accompanying fig. 6 was written in Brazil, the others in England.

Westwood, in his complete list, mentions two individuals captured on 28. 10. 25. He also gave a list of captures on a label attached to 70, and this agrees with the numbers and dates here recorded. It is therefore probable that the list is erroneous and that there were not more than eight individuals. On 68 Westwood had written "This is the only individual with the veins of H. W. suffused with black." The specimen is shown on Pl. III. fig. 6, where the feature mentioned by Westwood can be clearly seen when comparison is made with figs. 5 and 7. Westwood does not note the sexes. He employs the name *dero* only.

[I have followed H. W. Bates in regarding *D. rhoëo*, Feld., as a form of *dero*, differing "only in the greater breadth and irregularity of the dusky black border of the hind wing, especially in the female, and in the nervures which traverse the disk of the same wing being of a yellowish colour instead of black. In the female the discocellulars and the terminal parts of the median branches are accompanied by dusky streaks." *D. dero*, on the other hand, "has the hyaline

disks of the wings always clearer and the black borders more sharply defined than *D. rhoëo*. *D. dero* is peculiar to South-East Brazil, and is not found in the Amazon region, where the local form *D. rhoëo* takes its place. I have seen specimens of *D. rhoëo* also from the neighbourhood of Bogotá, New Granada. It flies in thinned parts of the forest in Ygapó, or flooded districts, in the dry season." (Trans. Linn. Soc. Lond. vol. xxiii., 1862, pp. 520, 521.)

I have quoted from Bates in full because, if his information be correct, we have here certain evidence of change in a local subspecific form within the narrow limits of five-and-twenty years. All Burchell's specimens come from South-East Brazil, and only two of them, viz. nos. 67 and 74 (Pl. III. fig. 5), can be regarded as *dero*. All the rest are examples of the heavily marked yellowish hind-winged *rhoëo* (compare figs. 6 and 7 with 5). It would be unwise to build too much on the conclusion that a change has occurred, especially as the interval cannot be more than about twenty-five years, inasmuch as Bates, when he wrote in 1861, was dealing with experiences which went back many years. But if his statements that "*dero* is peculiar to South-East Brazil" and that *rhoëo* takes its place to the north be confirmed, we are compelled to admit that a rapid change has occurred in the former area and that in 1825 *rhoëo* was dominant there. We should be obliged to regard the biological history as traversing the history laid down by systematics; for *dero*, with the older name, would then be but a very modern local form of the more ancestral although more recently named *rhoëo*. Should further enquiry support Bates's statement, it seems probable that synaposematic grouping has directed the trend of evolution—that resemblance to more heavily marked transparent Ithomiine associates in the north has been an advantage which has caused the persistence of the pronounced black markings of *rhoëo*, while *dero* has been selected as an approach towards less heavily marked members of Ithomiine groups in the south.

Ithomiine butterflies with a general resemblance to one another have a marked tendency to fly together, as Bates points out in this very species (*l. c.* p. 521). It has already been found in the case of *Leucothyris phenomoe* that the northern part of Eastern Brazil is characterized by a more heavily marked form (*Burchelli*) than the southern part (see pp. 43, 44). In many other cases the tendency towards a reduction of the black markings of transparent and black Ithomiinæ in South-Eastern Brazil has been shown in this memoir. It was apparent in *Pseudoscada* sp. nr. *utilla* (15),

Ithomia agnosia (22-24), and *Pteronymia* nr. *artena* (54, 55). This reduction of black and increase of transparency occurring independently in many genera is probably due to selection in the direction of synaposematic or Müllerian resemblance.—E. B. P.]

Ceratinia eupompe, Hübn.

29. 10. 25. ♀ = 75. Minas Geraes. (As 73.)
 4. 11. 25. ♂ = 76. Minas Geraes. (As 19.)
 8. 2. 26. ♂ = 77. Organ Mountains. (As 10-12.)
 9. 2. 26. 3 ♀ = 78-80. „ „ (As 21.)
 11. 2. 26. ♀ = 81. „ „ (As 16, 17.)
 12. 2. 26. 2 ♀ = 82, 83. Organ Mountains. "By the River Pacaquê."
 No data. ♀ = 84.

Westwood's notes and label agree in including an additional specimen dated 14. 2. 26 (Organ Mountains). In other respects his MS. agrees with the data here recorded. The determination agrees, but sexes are unnoted.

Ceratinia euryanassa, Feld.

- Bz. 563. I. 19. 10. 25. ♀ = 85. Minas Geraes. Discoberto. "Pap[ilio]."
 10. 11. 25. ♂ = 86. Minas Geraes. Discoberto.
 26. 9. 26. 5 ♂ = 87-91, 4 ♀ = 92-95 (92 and 95 bear Brazilian labels). Santos. "In a walk to Montserrat."
 "These *Papiliones* very plentiful in the woods": this referring of course to all specimens taken.
 No data. ♀ = 96.

Westwood gives two more individuals captured 26. 9. 26, and omits the date 10. 11. 25. The latter may be a slip or may be due to the later transposition of labels. In other respects and in the determination Westwood's notes agree, but sexes are omitted.

Ceratinia data, Boisd.

- Bz. 330. II. 14. 10. 25. ♂ = 97. Minas Geraes. Discoberto. "Papilio (*Horta*)."

It is probable that this specimen should bear the number 336 and that it was captured with 98 on Oct. 15th. See note on 108.

- Bz. 336. II. 15. 10. 25. ♂ = 98. Minas Geraes. "At the Discoberto do Antonio Velho. Pap[ilio]. In Sylvis."

- Bz. + 12. 11. 25. ♂ = 99. Minas Geraes. "At Mandioca."
 "Langsdorfi" is written on the Brazilian label.

12. 2. 26. ♂ = 100. Organ Mountains. (As 82, 83.)
 21. 2. 26. ♀ = 101. " " (As 49.)
 No data. ♀ = 102.

The numbers and dates agree with Westwood's notes. Westwood's determination was *Ithomia melphis*, a synonym of *dacta*. The sexes were unnoted.

Ceratinia Barii, Bates.

26. 5. 29. ♂ = 103. Rio Tocantins, N. of Itabóca, below the Falls of Guariba. "Sylva."
 Brit. Mus. "*Ninonia* Hew. var. *barii*."
 Named by Westwood *Ithomia ninonia*. Sex unnoted.

Mechanitis polymnia, Linn.

30. 10. 25. (Date probably erroneous, and should be 3. 3. 28 or 10. 12. 29. See below.) ♀ = 104. Minas Geraes. " (In the Forest.) On the N.E. side of the arraial of São João de Nêpomucéna." Locality probably erroneous, and should be Goyaz or Pará.
 5. 3. 28. ♂ = 105. Goyaz. "Caught by the Rio Vermelho, near the Carioca Aqueduct, by 'C'." C refers to Congo, Burehell's native assistant.
 7. 6. 29. ♀ = 106. Rio Tocantins. S. of Pará, Sta. Anna.
 7. 7. 29. ♀ = 107. Pará. "Eastward of my house."
 [105 was submitted to the late Mr. Osbert Salvin on Jan. 16, 1896. He considered it to be the "Guiana form of *Mechanitis polymnia*." Although without the black hind wing which in Guiana is characteristic of so many species, including the allied *M. pannifera*, Butl., the black markings are strongly developed on the secondaries of all the three female specimens. The occurrence of such strongly marked forms so far to the south as Goyaz was a surprise to me.—E. B. P.]

Westwood records two additional specimens, captured 3. 3. 28 (Goyaz. "Caught in the town by the Rio Vermelho; by C[ongo]") and 10. 12. 29 (Pará. "Suburbanæ"). On the other hand, he does not give the date now affixed to 104, viz. 30. 10. 25. It is probable that a label has been transposed in the manipulation of the specimens, and that 104 should bear the date 3. 3. 28 or 10. 12. 29. In other respects and in the determination Westwood's notes agree with these records. The sexes were unnoted.

Mechanitis lysimnia, Fabr.

Bz. 336. II. 15. 10. 25. ♀ = 108. Minas Geraes. (As 98.)

[It is probable that this specimen should bear the number 330 and that it was one of the "*Papilio (Horta)*" captured on Oct. 14 at Discoberto. Burchell probably accidentally interchanged its label with that of 97, either originally in Brazil or later when he set the specimens. The evidence is as follows:—The Brazilian note-book shows that two individuals believed by Burchell to be one form "*Papilio (Horta)*," captured on Oct. 14, were numbered 330, and that two others also believed to be one form, taken on Oct. 15 "in Sylvis," were numbered 336. Professor Westwood's list, repeated on a specimen of each species, agrees with the existing specimens in showing one 336 on *Mechanitis lysimnia* (108) and the other on *Ceratinia deta* (98). One 330 is on *deta* (97) and the other is now missing, but both of Westwood's lists agree in recording that it was affixed to a specimen of *lysimnia* which cannot now be found. Either Burchell twice paired *deta* and *lysimnia* as the same form on consecutive days or he accidentally interchanged one 330 with one 336. The following fact confirms the opinion that he made the latter mistake and not the former. A few days later, on Oct. 19th, we find in his note-book the following entry: "563 . . . (336)," indicating his belief that the single specimen denoted by the first number was the same species as the two individuals denoted by the second. Now 563 is *Ceratinia euryanassa* (85), a species which closely resembles *C. deta*, but only bears a very rough likeness to *M. lysimnia*. It is therefore probable that 330 was intended for two specimens of *M. lysimnia* and 336 for two of *C. deta*.—E. B. P.]

4. 11. 25. ♂ = 109, 2 ♀ = 110, 111. Minas Geraes. (As 19.)

10. 11. 25. 2 ♂ = 112, 113. Minas Geraes.

6. 12. 25. ♂ = 114. Rio de Janeiro. "In an excursion to the Summit of the Corcovado by the road by the Convent of Sta. Theresa, and along the Aqueduct."

31. 1. 26. ♀ = 115. Rio de Janeiro. (As 66.)

9. 2. 26. ♀ = 116. Organ Mountains. (As 21.)

12. 2. 26. ♀ = 117. " " (As 82, 83.)

16. 2. 26. ♀ = 118. " " Near River Pa-
caqué.

21. 2. 26. ♀ = 119. " " (As 49.)

28. 2. 26. ♀ = 120. "On the Rio Magé."

1. 3. 26. ♀ = 121. "Along the River Magé, upwards to the Fazenda da Lagóa."

7. 3. 26. ♀ = 122. Rio de Janeiro. "At Catombí."
 Bz. 9. 3. 26. ♂ = 123. Rio de Janeiro.
 10. 3. 26. ♂ = 123 A. Rio de Janeiro.
 15. 9. 26. ♂ = 124. Santos. "Papil[io]. At edge of the Forest, at S. Bento Monastery."
 Bz. 14. 12. 26. ♀ = 125. Cubatão, Lower Slopes of the Sérra.
 16. 12. 26. ♀ = 126. Cubatão. "Middle Part of the ascent up the Sérra."
 4. 3. 28. ♀ = 127. Goyaz. (As 105.)
 Westwood's name and list agree, except that he includes two more specimens which cannot now be found—one distinguished by the number 330, and a second specimen captured with 116 on 9. 2. 26. Sexes unnoted.

Aeria olena, Weym.

- Bz. 579. I. 21. 10. 25. ♀ = 128. Minas Geraes. "In a rossa at Discoberto, and along a channel (on the margin of the Forest) which conducts water to the house."
 "Pap[ilio]."
 Named *I. elara* in Westwood's list, which otherwise agrees. Unsexed.

Heteroscada gazoria, Godt.

10. 11. 25. ♂ = 129. Minas Geraes.
 Westwood's list agrees. He calls the specimen "*Napeogenes?*" in list, but on the insect itself he had written "*Yanina*, Hew. f. 116, pl. 19, vol. ii. Hew. Exot. butt. *Euritea*, Dry., not Cramer." Unsexed.

Heteroscada yanetta, Hew.

- Bz. 335. II. 15. 10. 25. ♂ = 130. Minas Geraes. (As 36.)
 Agrees with Westwood's list. Named *Napeogenes*. Unsexed. "Coll. Hew. but not named" in pencil indicates an unsuccessful reference to his friend Hewitson.

Heteroscada fenella, Hew.

29. 10. 25. ♀ = 131. Minas Geraes. (As 72.)
 Agrees with Westwood's list "Lent. Hewitson." The name "*fenella*, H." written in pencil by Westwood across Burchell's label. Unsexed.

Melinæa paraiya, Reak.

8. 2. 26. ♂ = 132. Organ Mountains. (As 10-12.)

Agrees with Westwood's list, where, however, it is named as a var. of *egina*. "*Mech. egina*" is written on a label attached to the specimen. Unsexed.

Melinæa egina, Cram.

7. 7. 29. ♂ = 133. Pará. (As 107.)

28. 7. 29. ♂ = 134. Pará.

Bz. 26. 1. 30. ♂ = 135. Pará.

Agrees with Westwood's list. Unsexed.

Melinæa ethra, Godt.

8. 2. 26. ♂ = 136. Organ Mountains. (As 10-12.)

Agrees with Westwood's list. Named by him *Mech. ethra*. Sex unnoted.

Methona themisto, Hübn.

14. 7. 29. ♂ = 137. Pará.

31. 7. 29. 2 ♂ = 138, 139. Pará.

Westwood's list indicates the former existence of a fourth specimen captured at Pará on 30. 7. 29. His name agrees. Sexes unnoted.

3 F

II. DANAINÆ.

Anosia erippus, Cram.

Bz. 122. I. 15. 8. 25. ♂ = 140. Rio de Janeiro. "In a cross-lane about halfway between the Gloria Hill and Botafogo Bay. All found on plants." "*Papilio*."

10. 1. 26. ♂ = 141. Rio de Janeiro. Práia Grande and S. João de Carahý.

27. 1. 26. ♀ = 142. Rio de Janeiro.

31. 1. 26. ♂ = 143. Rio de Janeiro. (As 66.)

26. 2. 26. 2 ♂ = 144, 145. Near Fréchal and the Rio Magé.

Brazilian date and later copy on 145.

1. 3. 26. 2 ♀ = 146, 147. (As 121.) Brazilian date and later copy on 147.

13. 3. 26. ♂ = 148. Rio de Janeiro. "From Magé. A.[M]."

13. 3. 26. ♀ = 149. Rio de Janeiro. "A.[M]."

1. 4. 26. ♂ = 150. Rio de Janeiro. "In the Valley of Catumbi."

3. 4. 26. ♀ = 151. Rio de Janeiro. "Along the Carioca Aqueduct."

23. 9. 26. 2 ♂ = 152, 153. Santos.

- Bz. 3. 11. 26. ♂ = 154. Santos. "On Monserrat."
 12. 11. 26. ♀ = 155. Santos. "In the Forest above the Monastery of São Bento."
 14. 6. 29. ♂ = 156. Pará.
 16. 6. 29. 2 ♂ = 157, 158. Pará. Brazilian date and later copy on 157.
 23. 6. 29. ♀ = 159. Pará.
 4. 7. 29. ♂ = 160. "
 11. 7. 29. ♂ = 161. "
 1397. + 14. 7. 29. ♂ = 162. Pará.
 Bz. 1397. + 14. 7. 29. = 162 A. Pará. A ♂ Danaine pupa-case from which the butterfly had emerged. Obviously the pupa of 162.
 23. 7. 29. Both dates and both }
 1397. } numbers written } = 162 B, 162 C. Pará.
 1398. } thus on one label. }
 14. 7. 29.

Two ♀ Danaine pupæ which had died. The species is probably the same as 162 A. Both are much gnawed, perhaps by parasites, perhaps at a later date by *Anthreni*. Both pupæ on a single pin, which bears an original Brazilian label with the number 1397 in addition to the later label with the two numbers and the two dates.

8. 8. 29. ♀ = 163. Pará.

The remaining lists in this paper were not in Westwood's handwriting.

The dates agree, except that the former existence of four or, perhaps, five additional specimens is indicated; another with the data of 149, another with those of 159, a specimen with the number 131, captured on 16. 8. 25 (Rio. "Above the Theresa Convent; and on the woody hill [or hills] along the Aqueduct"), and one captured on 30 10. 25 (Minas Geraës. "In the forest. On the N.E. side of the arraial of São João de Nêpomucéna.") The date 5. 7. 29 follows 4. 7. 29 in the list without the usual intervening mark which indicates a separate individual. Its insertion may be merely a copyist's error. If, however, this is not the case, the additional specimen was captured at Pará. The only name given in the list is *Danaïs*.

Beyond this point the absence of any reference to sex indicates that no determination is given in Westwood's list.

Tasitia gilippus, Cram.

- Bz. 110. II. 15. 8. 25. ♀ = 164. Rio de Janeiro. (As 140.)
 Bz. 900. I. + 25. 10. 25. ♂ = 165. Minas Geraes. (As 37, 38.)

31. 12. 25. ♂ = 166. Rio de Janeiro. "Excursion to the Summit of the Corcovado; from Catéte and up the valley of Laranjeiros."
26. 1. 26. ♂ = 167. Rio de Janeiro. "In a botanical and entomological excursion to the Barra Vermelha, Morro de Ladeira and Catombi."
27. 1. 26. ♀ = 168. Rio de Janeiro.
1. 3. 26. ♂ = 169. Magé. (As 121.)
7. 3. 26. ♀ = 170. Rio de Janeiro. "At Catombi."
9. 3. 26. ♀ = 171. " " "A.[M]."
13. 3. 26. ♀ = 172. " " "A.[M]."
24. 12. 26. ♀ = 173. Cubatão. "At Rio das Pedras and Cubatão."
20. 8. 27. ♀ = 174. N.W. of Mogy Mirim. "Urisánga to Itupéba."
- Bz. 3. 12. 28. ♀ = 175. Porto Real [Nacional].
29. 1. 29. 2 ♂ = 176, 177. Porto Real [Nacional].
- Bz. 1309. + 11. 2. 29. ♂ = 178. Porto Real [Nacional].
- "*Papilio*. The flight of this is remarkable, for it does not always hover by a constant motion of wings, but frequently sails with wings half extended, without moving them at all; nor is it very visible by what movement it sails along."
27. 2. 29. ♀ = 179. Porto Real [Nacional].
17. 3. 29. 2 ♂ = 180, 181. " " "
22. 3. 29. 2 ♂ = 182, 183. " " "Brazilian date and later copy on 182."
- Bz. + 23. 3. 29. ♀ = 184. " " "
24. 3. 29. ♂ = 185. " " "Manga."
28. 3. 29. 2 ♂ = 186, 187. " " "Brazilian date and later copy on 187."

The dates in Westwood's list agree, except that the former existence of three additional specimens is shown, viz. another of the same date as 164, another with the date of 180, 181, and a specimen captured 2. 3. 29 (Porto Real=Nacional). The fact that Burchell captured two specimens on 15. 8. 25 is also shown by his note-book. The only name given is *Danaïs*.

[I was extremely interested to read Burchell's note on specimen no. 178, inasmuch as it exactly describes a common mode of flight in the allied Danaine *Anosia pleurippus*. I was much struck with it in the Northern United States in the summer of 1897, for I had never seen a butterfly sail in the same manner before. The appearance produced by the half-extended wings was singularly boat-like, the resemblance being much increased by a continual oscillation from side to

side, like the roll of a vessel. The underside of these *Danainæ* is even more conspicuous than the upperside, and it occurred to me that the significance of the peculiar attitude and movement was to display the underside during flight. The method adopted is probably the only means by which this end could be achieved.—E. B. P.]

Lycorea halia, Hew.

10. 11. 25. = 188. Minas Geraes.

31. 12. 25. = 189. Rio de Janeiro. (As 166.)

Bz. + 1. 3. 26. = 190. Magé. (As 121.)

Bz. 10. 3. 26. = 191. Rio de Janeiro.

Bz. 19. 3. 26. = 192. „ “In the Valley of Catombi.”

1. 4. 26. = 193. „ “In the Valley of Catumbi.”

30. 10. 27. = 194. E. of Goyaz. On road from Meia Ponte. “Conceição.”

24. 12. 27. ♂ = 195. Goyaz.

Name and dates agree with Westwood's list, except that he refers to a ninth specimen captured on 8. 2. 26, “Organ Mountains (in a ride to the Cattle Pounds and the Milho Roça).”

[These specimens may afford a deeply interesting instance of change in something under three quarters of a century, or, on the other hand, the results may be merely due to a deepening in the tint of a yellowish pigment owing to age.

Lycorea halia is an outlying member of Blandford's Group 3, “East Brazilian Type,” Division (a), having “the apical spots on the fore wing yellow.” This important group was shown by Mr. W. F. H. Blandford to the Entomological Society in 1897 (see Proc. Ent. Soc. Lond., May 5, 1897). It is mainly characterized by a bright yellow horizontal band traversing the hind wing parallel with the inner margin of the fore wing. The *Lycorea*, being an outlying member of the group, has a pale yellowish band, which is very different from the bright tint of the more centrally placed members, such as the species of *Heliconius*. Now Burchell's specimens are far more removed from the group than those of recent date, inasmuch as the band is but slightly paler than the tawny ground-colour of the wing. In favour of the view that a change has actually occurred and is here registered are the following facts:—(1) the specimens are, as a whole, singularly perfect; (2) one specimen is lighter than the rest, its band being of a shade common in recent specimens; (3) the

yellow band, the characteristic feature of the group, is a very special and peculiar one among the numerous patterns and colour combinations of Neotropical synaposematic groups; (4) that a butterfly which is outlying to-day should be still more outlying seventy-five years ago is not surprising. Rapid change is more probable in a case of this kind than perhaps in any other. On the other side it must be remembered:— (1) that the yellow tints of some butterflies are very apt to darken; (2) that similar dark forms of *Lycorea halia* are to be found in collections of much less age, or even occasionally in recent consignments.

The latter argument, of course, supports both sides of the case.

It is not too much to hope that the question may be settled by intentional exposure or other experiments upon the yellow pigment of recent specimens, as well as by the investigation of all available material.

Miss Sanders and I have already carefully compared the Burchell specimens with the series at Oxford, in the British Museum, and in the Godman-Salvin Collection, and there can be no doubt about the existence of a marked difference between the bands of the Burchell specimens as a whole and those of more recently captured individuals of *L. halia*.

When in the later pages of this memoir the Heliconiinae belonging to the same group are recorded, it will be convenient to reproduce typical examples of as many members as possible by the best photographic processes which we can command. I think that the differences of shade can be accurately rendered in this manner and made available in a half-tone plate.—E. B. P.]

Ituna ilione, Cram.

Bz. 12. 11. 26. = 196. Santos. "Forest by S. Bento."

Date and name as in Westwood's list.

3 G

III. SATYRINÆ.

Pierella lamia, Sulz.

13. 5. 29. 2 ♂ = 197, 198. Rio Tocantins, Carolina. "Boa Vista in Sylva densa" on 197. There are two Brazilian labels on 198: "Sylva densa" on one, "13. 5. 29 Boa Esper" on the other.

Date as in Westwood's list, where, however, only one specimen is mentioned. 198, a very poor specimen, was found among duplicates and recognized by Burchell's hand-

writing on the label. The printed "Burchell Collection" label affixed to the specimens at Oxford was wanting.

When the name is not referred to, it is to be understood that none is given in Westwood's list.

Pierella nereis, Drury.

14. 1. 26. ♀ = **199**. Rio de Janeiro. (As **29**.)

14. 2. 26. ♀ = **200**. Organ Mountains. Near R. Pacaqué.
Dates as in Westwood's list.

Pierella astyoche, Erich.

7. 8. 29. ♀ = **201**. Pará.

Date as in Westwood's list.

Pierella lena, Linn.

Bz. + 19. 5. 29. ♀ = **202**. Descent of Rio Tocantins.
Rio Araguay.

Date as in Westwood's list.

Pierella dracontis, Hübn.

Bz. + 24. 7. 29. ♀ = **203**. Pará.

4. 12. 29. ♂ = **204**. Pará, S. José.

Dates as in Westwood's list.

Anchiphlebia archæa, Hübn.

12. 3. 26. ♂ = **205**. Rio de Janeiro. "Carioca Aqueduct."

Westwood's list includes another specimen captured on 22. 3. 26 (Rio. "Along the Aqueduct to the head of the Valley of Laranjeiros").

Euptychia ocirrhoe, Fabr.

Bz. 190. I. 8. 9. 25. ♀ = **206**. Rio de Janeiro. "Along the Aqueduct. *Papilio*."

31. 12. 25. ♂ = **207**. Rio de Janeiro. (As **166**.)

Bz. + 7. 3. 26. ♂ = **208**. Rio de Janeiro. "At Catombí."

9. 3. 26. 2 ♂ = **209, 210**, ♀ = **211**. Rio de Janeiro. Brazilian date on **209**.

10. 3. 26. ♂ = **212**. Rio de Janeiro.

12. 3. 26. ♀ = **213**. " Carioca Aqueduct."

15. 3. 26. ♂ = **214**. " Catombi. In plantis."

16. 3. 26. ♂ = **215**. " In the upper part of the Valley of Catombi, and along the road thence to Rio Comprido and Matto Porcos."

17. 3. 26. 2 ♂ = 216, 217. Rio de Janeiro. "Along the Carioca Aqueduct, and descending the high hill (mentioned 31. 1. 26) into the valley of Catombi. But they were mostly along the Aqueduct, and only a few on the hill." Brazilian date on 217.
18. 3. 26. ♀ = 218. Rio de Janeiro. Along the Carioca Aqueduct.
- Bz. 20. 3. 26. ♀ = 219. Rio de Janeiro. Along the Carioca Aqueduct.
- Bz. 21. 3. 26. 2 ♂ ♀ = 220, 221. Rio de Janeiro. Along the Carioca Aqueduct.
22. 3. 26. ♂ = 222. Rio de Janeiro. Along the Carioca Aqueduct.
1. 4. 26. ♂ = 223. Rio de Janeiro. (As 193.)
19. 5. 29. 2 ♂ ♀ = 224, 225. R. Tocantins. (As 202.)
7. 6. 29. ♀ = 226. R. Tocantins. Near Pará. "Sta. Anna."
1. 8. 29. ♂ = 227. Pará.
18. 9. 29. ♂ = 228. Pará, S. José. "In umbrosis Silvæ."
24. 10. 29. ♂ = 229. " " "In Sylva."
15. 11. 29. ♂ = 230. " " "Caminho de Chamonte."

Bz. 5. 1. 30. ♂ = 231. Pará.

All the twenty-six specimens here recorded agree with Westwood's list, but the latter also contains thirteen individuals which cannot now be found. Of these, five were captured on dates unrepresented by existing specimens, viz.:—one taken 7. 11. 25 towards the end of the expedition into Minas Geraes, three taken at Rio on 13. 3. 26, 19. 3. 26, 3. 4. 26, and one taken at Goyaz (Caminho de Carreira) on 10. 4. 28 respectively. The remaining eight specimens are made up as follows:—One more individual captured on 7. 3. 26, one more (viz. No. 1056) on 17. 3. 26, two more on 9. 3. 26, one more on 16. 3. 26, one more on 18. 3. 26, two more on 20. 3. 26.

No. 1056 in the "Brazilian Note-book" informs us that *E. ocirrhoe* is one of three species, captured 17. 3. 26, which "frequent the woods."

Although unnamed in the list, specimen 227 bears a label with the name "*Euptychia ocirrhoe*" written by Westwood.

Euptychia mollina, Hübn.

1. 8. 29. 2 ♀ = 232, 233. Pará. Brazilian date and later copy on 233.
4. 8. 29. ♀ = 234. Pará.

5. 8. 29. ♀ = 235. Pará.

8. 8. 29. ♀ = 236. „

Bz. 15. 11. 29. 2 ♀ = 237, 238. Pará. (As 230.)

Westwood's list agrees, except that it mentions three additional individuals captured at Pará,—one on 4. 7. 29 and two on 4. 12. 29. The name given is *Neonympha mollina*.

Euptychia herse, Cram.

Bz. + 23. 7. 29. ♂ = 239. Pará. "Between my house and the city."

Westwood's list agrees.

Euptychia chloris, Cram.

31. 5. 29. ♂ = 240. R. Tocantins, near Pará. "Baião; P.[M]."

Westwood's list agrees.

Euptychia cosmophila, Hübn.

20. 3. 26. = 241. Rio de Janeiro. Along the Carioca Aqueduct.

This specimen was submitted to Dr. F. D. Godman, who confirmed the identification.

Westwood's list agrees.

Euptychia cluena, Drury.

10. 3. 26. 2 = 242, 243. Rio de Janeiro.

1055. II. 17. 3. 26. 2 = 244, 245. Rio de Janeiro. (As 216, 217.) "Both these caught in deep woods, as the preceding." The latter refers to 351, and indicates capture "in the forest down the hill."

18. 3. 26. 2 = 246, 247. Rio de Janeiro. Along the Carioca Aqueduct. Brazilian date on 246.

20. 3. 26. 3 = 248-250. Rio de Janeiro. Along the Carioca Aqueduct. Brazilian date on 248.

3. 4. 26. = 251. Rio de Janeiro. Along the Carioca Aqueduct.

245 is probably the only female.

Westwood's list agrees, except that the date 10. 2. 26 is substituted for 10. 3. 26. This is almost certainly a mistake of the copyist. It may be mentioned, however, that on the former date Burchell was in the Organ Mountains.

Euptychia myncea, Cram.

10. 8. 29. = 252. Pará.

30. 11. 29. = 253. Pará, S. José.

Euptychia penelope, Fabr., = *clarissa*, Cram.

Bz. 1332. + 2. 3. 29. = **254**. Porto Real [Nacional].
 “*Papilio*. In woody places among the bushes. This
 and its congeners fly in a very hovering zigzag manner
 low among the bushes and herbage.”

Bz. 15. 3. 29. = **255**. Porto Real [Nacional].

7. 6. 29. = **256**. R. Tocantins. (As **226**.)

27. 7. 29. = **257**. Pará.

15. 11. 29. = **258**. Pará, S. José. (As **230**.)

It is probable that the individuals of *myncea* and *penelope* are considered together in Westwood's list. The dates here recorded agree, except that 10. 8. 29 (**252**) is replaced by 10. 2. 29, probably a clerical error. The list furthermore includes individuals captured on 29. 12. 23 (Porto Real) and 18. 6. 29 (Pará).

Euptychia sp.

28. 5. 28. 2 ♂ = **259** (Pl. III. fig. 8), **260**. Goyaz. “Peak near Cánta Gállo.” “In summitate montis.” Burchell's label, written in England, is reproduced to the right of and below figure 8.

These specimens were submitted to Dr. F. D. Godman, who was unable to name them. Mr. F. A. Hecron considers that the markings best agree with *E. similis* (Butl.), but he points out that the eyes of the latter are hairy, while those of **259**, **260** are naked. In the character of the distal end of the cell of the fore wing these specimens also best agree with *similis* and its allies. The marked development of the ocelli on both wings is peculiar, together with the extent to which they appear on the upper surface. The fore wing is especially remarkable in these respects. The species is almost certainly new and both striking and distinct; but the specimens are unfortunately in such poor condition that it is impossible to make either of them types. As the locality and time of year are precise, it is to be hoped that some naturalist in Brazil will capture examples which may be described, and named after the great traveller and observer.

Westwood's list agrees.

Euptychia electra, Butl.

Bz. 1306. + 8. 2. 29. 2 = **261** (Pl. III. fig. 9, showing underside), **262** (fig. 10). Porto Real [Nacional]. “Bo-racão.”

“This genus is entirely sylvan, and delights to hover low among the herbage and thicker foliage. This was

caught in the Carasco, or thicker campo-woods ; and another afterwards caught in the back yard."

The two labels affixed to each specimen are reproduced on the Plate to the right side of the respective figures. The lower number, written less carefully and with thicker lines, is in each case an original Brazilian label. The upper number and date, written by Burchell after his return, are upon a separate piece of paper, although the overlapping upper edge of the older label is in each case invisible.

Bz. 10. 2. 29. = **263**. Porto Real [Nacional].

These three specimens were submitted to Dr. F. D. Godman, who writes (Feb. 27, 1904):—"Your specimens, which exactly resemble six I have from Chapada, have the four ocelli on the hind margin of the underside of the fore wings strongly marked, whereas in Butler's type [of *electra*], which is from Bahia, they are obsolete; but I have specimens showing all intermediate gradations from Brazil. These ocelli in the Satyridæ generally vary much both in size and distinctness, and are not a very good character for distinguishing a species."

The ocelli mentioned by Dr. Godman are well seen in fig. 9 of the accompanying Plate III.

Westwood's list agrees.

Euptychia armilla, Butl.

8. 11. 28. 6 = **264-269**. Near Porto Real [Nacional].

"Corrego Raiz." Brazilian dates on **266**, **268**, and **269**.
No data. = **270**.

These specimens were kindly named for us by Dr. F. D. Godman, F.R.S.

Agrees with Westwood's list, except that the latter includes a seventh individual captured 8. 11. 28, a second without data, and an individual captured 10. 2. 29 (Porto Real).

Euptychia liturata, Butl.

26. 9. 26. = **271**. Santos. "In a walk to the Chapel on Montserrat."

Bz. 30. 8. 28. = **272**. Near Jaragua. "Estiva."

1250. + 11. 9. 28. 2 = **273, 274**. Between Jaragua and Cavalcanti. "Trahíras, R. Vendinha." "*Papilio*. Flying low among grass in woods or margin of woods, in considerable numbers. They have the same habits and hovering mode of flight as their congeners at the Cape of Good Hope." Brazilian label and later copy on **274**.

These specimens were also named for us by Dr. F. D. Godman.

Westwood's list probably agrees, except that an additional individual captured 11. 9. 28 is mentioned. Another individual, captured 26. 11. 26, is probably **297**, accidentally associated with *liturata* instead of *camerta*.

Euptychia acmenis, Hübn.

10. 3. 26. 2 = **275, 276**. Rio de Janeiro. Along the Carioca Aqueduct.
 18. 3. 26. 2 = **277, 278**. Rio de Janeiro. Along the Carioca Aqueduct. Brazilian date on **278**.
 21. 3. 26. = **279**. Rio de Janeiro. Along the Carioca Aqueduct.
 3. 4. 26. = **280**. Rio de Janeiro. Along the Carioca Aqueduct.

Westwood's list agrees.

Euptychia camerta, Cram.

- Bz. 350. II. 15. 10. 25. 2 = **281, 282**. Minas Geraes.
 "At the Discoberto do Antonio Velho; *P[apilio]*."
 Bz. 470. I. 16. 10. 25. = **283**. Minas Geraes. Discoberto.
 "*Papilio*."
 Bz. 829. I. + 23. 10. 25. = **284**. Minas Geraes. Discoberto. "*Pap[ilio]*."
 914. II. 25. 10. 25. 2 = **285, 286**. Minas Geraes.
 "*P[apilio]*. At Discoberto, near João Pedro's house."
 Brazilian label and later copy on **285**.
 Bz. 1002. I. + 27. 10. 25. = **287**. Minas Geraes. "At São João de Nepomucena and on the road from Discoberto. *Pap[ilio]*."
 28. 10. 25. 2 = **288, 289**. Minas Geraes. (As **72**.)
 4. 11. 25. 3 = **290-292**. " (As **19**.)
 Bz. + 6. 11. 25. = **293**. Minas Geraes. "At Capitão Leite's." Near Nepomucena.
 9. 2. 26. = **294**. Organ Mountains. "By the River Pacaqué."
 Bz. 17. 3. 26. = **295**. Rio de Janeiro. (As **216, 217**.)
 Bz. 20. 3. 26. = **296**. " Along the Carioca Aqueduct.
 26. 11. 26. = **297**. Santos. (As **8**.)
 7. 3. 27. 3 = **298-300**. Near S. Paulo. "Morumby. Walk to Porto." "In Silva" on **299**, "*Sylva*" and date on Brazilian label on **300**.

24. 3. 27. = **301**. Near S. Paulo. "On Road W. beyond Praça da Aleyria."
 8. 4. 27. = **302**. Near S. Paulo.
 23. 4. 27. = **303**. " "
 10. 5. 27. 2 = **304, 305**. Near S. Paulo. "About the Tiete and near Sta. Anna."
 18. 6. 27. = **306**. Near S. Paulo.
 22. 3. 28. = **307**. Near Goyaz.
 1. 4. 28. = **308**. " "
 19. 4. 28. = **309**. " "
Bz. 30. 4. 28. = **310**. Near Goyaz.
Bz. 12. 6. 28. = **311**. " "
Bz. 1303. I. + 4. 2. 29. = **312**. " Porto Real [Nacional].
 " *Papilio*. Caught in the back yard, and perhaps only a weather-worn variety."
 5. 2. 29. = **313**. Porto Real [Nacional].
Bz. 6. 3. 29. = **314**. Porto Real [Nacional].
Bz. 9. 3. 29. = **315**. " "
 15. 3. 29. = **316**. " "
Bz. + 17. 3. 29. = **317**. " "
Bz. + 9. 4. 29. = **318**. " "
 22. 4. 29. = **319**. Porto Real [Nacional]. "Various" [? places].
Bz. + 19. 5. 29. = **320**. On R. Tocantins. R. Araguay.
 26. 5. 29. = **321**. R. Tocantins, N. of Itaboca. Near Falls of Guariba.
 26. 6. 29. 2 = **322, 323**. Pará. "Near my house (Pomba Roçinha)." Brazilian date and later copy on **323**.
 6. 7. 29. = **324**. Pará.
 27. 7. 29. = **325**. " "
 10. 9. 29. = **326**. Pará, S. José.
 17. 10. 29. = **327**. " "
 8. 11. 29. 2 = **328, 329**. Pará, South of S. José.
 15. 11. 29. = **330**. Pará, S. José. "Caminho de Chamonite."
 8. 12. 29. = **331**. Pará, S. José. "Suburbanæ."

Westwood's list agrees in a remarkable manner with this long series of specimens. He separated the individuals into four sets (unnamed), apparently influenced by the development of the eye-spots upon the underside. The only difference is the substitution in his list of 22. 4. 28 for 22. 4. 29, probably a mistake in copying, and the omission of **297**. The latter was probably included with the individuals of *liturata*.

Euptychia quantius, Godt.

9. 2. 26. ♂ = **332**. Organ Mountains. "By the River Pacaqué."

This specimen has been submitted to Dr. F. D. Godman, who considers that the species is probably *quantius*.

Westwood's list agrees.

Euptychia renata, Cram.

27. 8. 28. ♂ = **333**. Near Jaragua. Goiaveira. "All these Lepidoptera were caught at the ford of the rivulet at Goiaveira, at 5 P.M."

26. 5. 29. ♀ = **334**. On R. Tocantins. (As **321**.) "Silva."

Westwood's list agrees, except that 26. 8. 29 is substituted for 26. 5. 29, probably a copyist's error.

Euptychia marmorata, Butl.

- Bz. + 14. 2. 26. = **335**. Organ Mountains. Near R. Pacaqué.

13. 4. 27. = **336**. Near S. Paulo.

- Bz. 10. 5. 27. = **337**. Near S. Paulo. "About the Tiete and near Sta. Anna."

14. 6. 27. = **338**. Near S. Paulo.

Westwood's list agrees.

Euptychia libye, Linn.

31. 5. 29. = **339**. R. Tocantins. Baião. "P.[M]."

17. 9. 29. = **340**. Pará, S. José.

17. 11. 29. 2 = **341, 342**. Pará, S. José.

7. 1. 30. = **343**. Pará.

Westwood's list agrees, except for an additional specimen captured 10. 8. 29 (Pará).

Taygetis valentina, Cram., form *euptychidia*, Butl.

12. 5. 28. = **344**. Goyaz. "Caught in the woodhouse."

We owe this determination to the kindness of Mr. F. A. Heron.

In Westwood's list 15. 5. 28 is substituted for 12. 5. 28. The words "Caught in the woodhouse" are present, proving that the discrepancy is merely a copyist's error.

Taygetis Andromeda, Cram.

9. 3. 26. = **345**. Rio de Janeiro.

Compared with Godman-Salvin Coll. (6 L. Amazons, 1 N. Brazil, 1 no locality.) The Burchell specimen has a broader brighter yellow band on fore wing than these, or six Hope Coll. specimens (not Brazilian).

Westwood's list agrees.

Pedaliodes phanias, Hew.

9. 2. 26. ♂ = 354. Organ Mountains. "By the River Pacaqué."

Westwood's list agrees.

In addition to the individuals which Westwood's list shows to be missing from certain of the above-mentioned species, three small categories separated out in the list have not been traced at all. They are as follows:—

Hipparchia 5. Two individuals—14. 6. 27 and 1399. 21. 7. 29. [These two individuals were subsequently found among the *Brassolineæ*. See Nos. 444, 445 on p. 74.]

" 27. One individual—27. 8. 28. [This specimen has now been recovered. It is a dry-season form of *Euptychia grimon*, Godt. Its place would be between *E. quantius* and *E. renatus*, and its number 332 A.]

" 35. Four individuals—118. 15. 7. 25, one without data, and the two following, which are certainly erroneous: 137, shown by the notebook to be a *Cicada*; 153, which is similarly found to be a *Cassida*.

EXPLANATION OF PLATE III.

The Plate has been printed from a half-tone block prepared from a beautiful photograph of the actual specimens taken in the Oxford University Museum by Mr. Alfred Robinson. All the figures are the natural size.

Fig. 1. *Leucothyris phenomoe*, Dbl. & Hew., n. subsp. *Burchelli*. A representation of specimen 64, the type of the subspecies. The heavier black markings which are characteristic of *Burchelli* as compared with *phenomoe* are at once apparent when figs. 1 and 2 are contrasted with 3 and 4. Burchell's label, written in England, is reproduced to the right of the figure.

Fig. 2. Another example of the form shown in fig. 1. A representation of 65. Burchell's label, written in England, is reproduced to the right of the figure.

Figs. 3 & 4. Two examples of *Leucothyris phenomoe*, Dbl. & Hew. Representations of specimens 60 and 61 respectively. Burchell's labels, written in England, are reproduced to the right of the figures to which they respectively refer.

Fig. 5. *Dircenna dero*, Hübn. A representation of specimen 74. The black markings are far less heavy than in figs. 6 and 7. On the

other hand, it must be remembered that **74** is a male, while **68** and **72**, the specimens represented in figs. 6 and 7, are females. **74** is also more worn than the other two, and this tends to diminish the depth of the black markings. But, making all allowances, **74** must always have been much less heavily marked than **68** and **72**. Burchell's label, written in England, is reproduced to the right of the figure.

Fig. 6. *Dircenna dero*, Hübn., form *rhoëo*, Feld. A representation of specimen **68**. H. W. Bates believed that this form is replaced by typical *dero* in S.E. Brazil, and yet six out of Burchell's eight specimens from this very locality are *rhoëo*. Burchell's label, written in Brazil, is reproduced to the right of the figure.

Fig. 7. *Dircenna dero*, Hübn., form *rhoëo*, Feld. A representation of specimen **72**, another heavily marked form, although the median nervures of the hind wing are much less suffused with black than in the specimen shown in fig. 6, which is peculiar in this respect among all Burchell's captures. Burchell's label, written in England, is reproduced to the right of the figure. The figure appears to represent a butterfly with shorter broader wings than those of the originals of figs. 5 and 6. This is merely the effect of fore-shortening, the wings of the former having drooped after resetting. The obvious difference in the figures is a convincing demonstration of the false impression of form conveyed by the old British mode of setting with sloping wings.

Fig. 8. *Euptychia* sp. A representation of specimen **259**. Burchell's label, written in England, is reproduced to the right of and below the figure.

Fig. 9. *Euptychia electra*, Butl. A representation of the underside of specimen **261**. The four small submarginal ocelli on the fore wing, which are so distinctly shown in the figure, are obsolete in the type of *electra*, from Bahia. Burchell's two labels are reproduced to the right of and rather below the figure. The lower number, which is really on a separate label, was written in Brazil, the upper number and the date in England.

Fig. 10. *Euptychia electra*, Butl. A representation of the upperside of specimen **262**. Burchell's two labels are reproduced to the right of the figure. They were written as described in fig. 9.

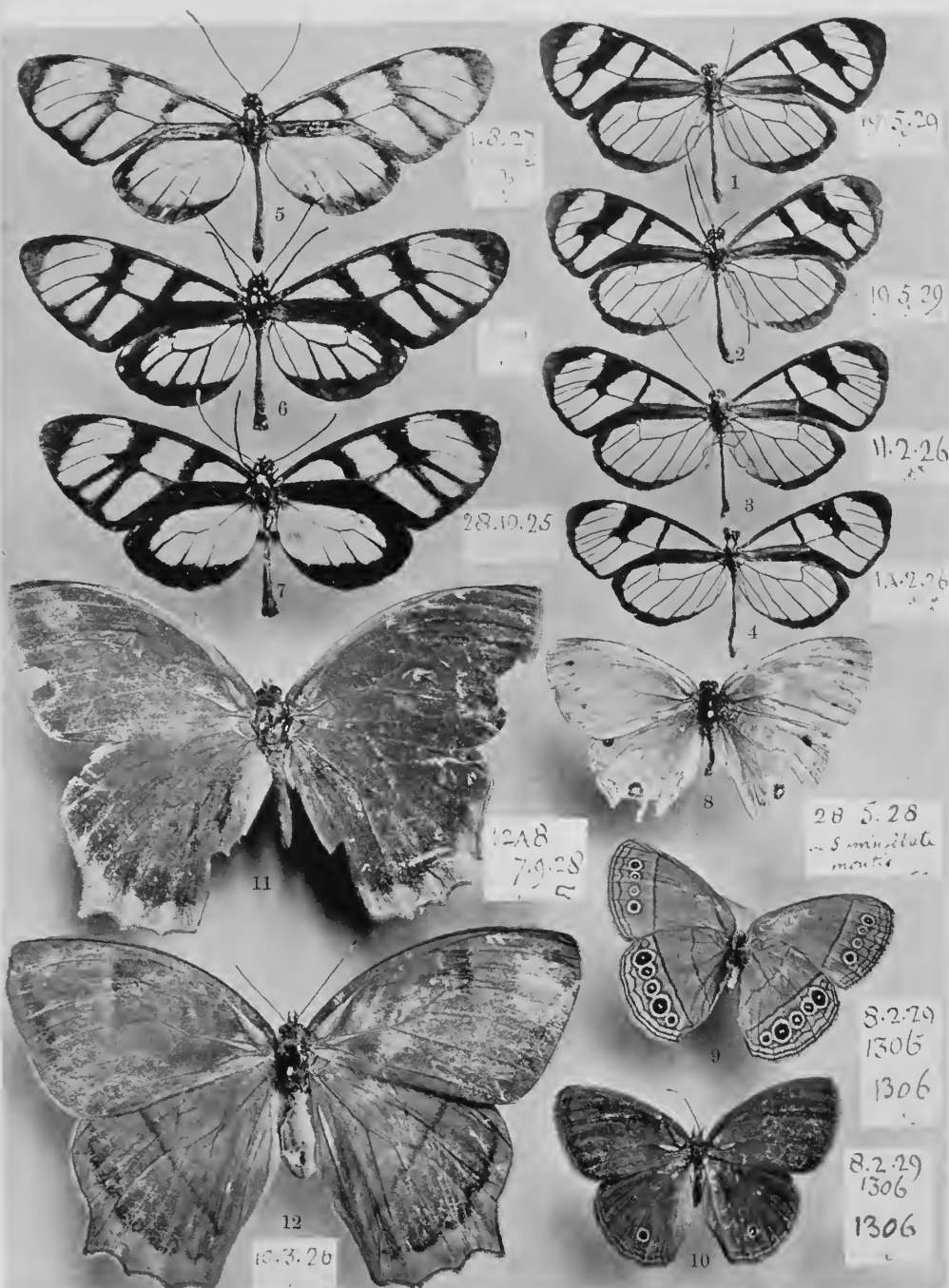
Fig. 11. *Taygetis virgilia*, Cram. A representation of specimen **352**. The label, written by Burchell in England, is reproduced on the right side. The rufous hind marginal border of the hind wings is well indicated. This feature, which is characteristic of Central-American specimens, is here found in both of Burchell's captures (7.9.28) from the Maranhão River, to the N.E. of Goyaz.

Fig. 12. *Taygetis virgilia*, Cram. A representation of specimen **349**. The label, written by Burchell in England, is reproduced below the figure. The pale brown border of the hind wings is seen to be very different from that of fig. 11. The appearance here shown is common to all three specimens from Rio (**348-350**), just as that of fig. 11 is common to the two from the Rio Maranhão.

3 H

IV. MORPHINÆ.

THE following paper contains an account of the Morphinæ and Brassolinæ collected by Burchell in Brazil. The notes of habits and modes of flight are not only of the deepest interest on account of their early date, but even more from



Alfred Robinson, photo.

All the figures are the natural size.

André & Sleigh, Limited.

Butterflies Captured in Brazil,

By W. J. BURCHELL (1825-29), with the corresponding manuscript labels.

their intrinsic value and the precision conferred by the association of each record with a particular specimen. In checking the data in the manuscript I have had much kind and efficient help from Mr. J. C. Moulton, of Magdalen College. The probability of error is so high in a work of this kind, that the task of verification is both prolonged and laborious. The manuscript of all papers on this Brazilian collection requires the most careful comparison with the data on the specimens themselves, with those contained in Burchell's two manuscript note-books, and in Professor Westwood's list, while the inevitable occasional inconsistencies between these sources demand the utmost attention.

Professor Westwood's manuscript Catalogue of "Burchell's Morphides" contains both Morphinae and Brassolinae grouped under 27 numbers, some of which were afterwards united by a bracket. With one or two exceptions the material is entirely unnamed. The list itself, which is neatly written in a clerk's hand, contains several errors, of which the probable corrections are indicated below. A note and two suggested names in Professor Westwood's handwriting are seen opposite three of the species separated out by him. A single number in the list "M. 21" refers to a Nymphaline butterfly (a *Prepona*) accidentally included and afterwards detected by Professor Westwood; while one species of Brassoline butterfly (444, 445 on p. 74) was accidentally placed in the Catalogue of *Hipparchia* (H. 5) and two of the same group in the Catalogue of Nymphalines (N. 18 and N. 20*).

The following arrangement of numbers and dates is carefully explained on pp. 37, 38. Notes, other than numbers and dates, written on labels attached to the specimens are placed between inverted commas immediately after the numbers in heavy type, and immediately before the locality. They are found on relatively few specimens. When a specimen bears a number only, the date, recovered from Burchell's note-book, is placed between square brackets. "a." and "p." associated with the date stand for "A.M." and "P.M."

E. B. POULTON.

Morpho laertes, Drury.

- Bz. + 23. 2. 26. = 355. Organ Mountains. Near Frechal,
near R. Pacaqué.
19. 3. 26. = 356. Rio de Janeiro. "In the valley of
Catombí."
22. 3. 26. = 357. Rio de Janeiro. "Along the [Carioca]
Aqueduct to the head of the valley of Laranjeiros."

3. 4. 26. = **358**. Rio de Janeiro. "Along the Carioca Aqueduct."
 4. 3. 27. = **359-361**. Near S. Paulo. "Morumbý: over the hilly pastures E^d of the house."
Bz. 4. 3. 27. = **362**. "Lente volans, secus marginem sylvæ." Near S. Paulo. As **359-361**.
 12. 3. 27. = **363**. "In silvis et silvaticis." Near S. Paulo. "Morumbý. Walk to old house."
 16. 3. 27. = **364**. "Between Morumbi and S. Páulo."
 Westwood's list, which also includes no. **365**, agrees, save for the statement that two specimens were captured 16. 3. 27.

Morpho catenarius, Perry.

4. 3. 27. = **365**. Near S. Paulo. (As **359**.)

Morpho perseus, Cram.

- Bz.* + 2. 6. 29. = **366**. "Picked up floating dead on the river." R. Tocantins, just below Baião: "Sitio das Pedras."
 Westwood's list agrees.

Morpho anaxibia, Esp.

1067. 3. 4. 26. ♂ = **367**. Rio de Janeiro. "Along the Carioca Aqueduct. *Papilio*. 'O. Imperador?' Above entirely metallic blue, beneath a plain brown."

Westwood's list agrees, but does not include the following specimen.

6. 3. 27. ♂ = **368**. "Hab. in densis sylvarum volatu lento altiore in cursu subrecto." Near S. Paulo; "Morumbý. Road N.N.W. of house."

The following passage in the Brazilian note-book almost certainly refers to this species:—"6. 3. 27. *Papilio*—at Morumbý. In the interior of the forest. Flies slowly and steadily; generally high."

[Three wings of this specimen with Burchell's MS. label fortunately still attached, were found, Feb. 2, 1904, among insects of entirely different orders.—E. B. P.]

Morpho adonis, Cram.

28. 10. 25. ♂ = **369**. Minas Geraës. "In the Forest on the West and on the East side of S. João de Nêpomucéna."
 29. 10. 25. 2 ♂ = **370, 371**. Minas Geraës. "In the forest on the S.E. side of S. João de Nêpomucéna."

- 29 or 30. 10. 25. ♂ = **372**. Two labels affixed to one specimen. Minas Geraës. (As **370** or **373**.)
 30. 10. 25. 2 ♂ = **373, 374**. Minas Geraës. "(In the forest.) On the N.E. side of the Arraial of São João de Nêpomucéna."
 23. 2. 26. ♂ = **375**. Organ Mountains. (As **355**.)

Westwood's list gives another individual with the data 8 p. 15. 2. 26, and also indicates that the two labels on no. **372** were placed upon two individuals at the time when the Catalogue of Morphides was written. Burchell was near the R. Pacaqué in the Organ Mountains on Feb. 15, 1826. His Geographical Catalogue reads "along the road, 1½ mile S. of the house."

Morpho cytheris, Godt., = *portis*, Hübn.

11. 2. 26. ♂ = **376**. Organ Mountains. "By the River Pacaqué." "In a walk to the Ipé trees."
 Bz. + 20. 2. 26. ♂ = **377**. Organ Mountains. Near R. Pacaqué. "Near a Rivulet East of the house."
 Westwood's list agrees.

Morpho menelaus, Linn., f. *terrestris*, Butl.

- Bz. + 23. 7. 29. = **378**. Pará. "Between my house and the City."
 Westwood's list agrees. He placed this and the following under the same catalogue no.

Morpho menelaus, Linn., f. *menelaus*, Linn.

23. 7. 29. = **379**. Pará. (As **378**.)
 Westwood's list agrees.

Morpho menelaus, Linn., f. *nestor*, Linn.

- Bz. 1367. + Bz. 22. 4. 29. Sylva mas et foem. + 22. 4. 29. 1367 foem. ♀ = **380**. R. Tocantins, Porto Real [Nacional]. The specimen bears two Brazilian labels and one English.

Westwood's list agrees, save that by a clerical error 1376 is written for 1367. The corresponding label of the male associated with **380** is probably misplaced upon a female specimen of *M. achilles*, no. **404**.

Morpho achilles, Linn., f. *achilleana*, Hübn.

- Bz. 308. [14. 10. 25.] ♂ = **381**. Minas Geraës. Burchell was at Parahiba on Oct. 12 and "at the Discobérto do

Antonio Velho" on Oct. 15. "*Papilio*. Magna. Supra cœrulea, margine lato nigro, punctis (albis in anterioribus, et rubris in posterioribus) marginalibus. Macula alba in margine anteriore alarum anteriorum. Subtus fusca ocellis pluribus." "This inhabits thick forests and hovers along alleys and openings in the woods, and is difficult to catch, although it flies generally near the ground."

Bz. 576. [21. 10. 25.] ♀ = 382. Minas Geraës. "*Papilio*. In a rossa at Discoberto, and along a channel (on the margin of the forest) which conducts water to the house." Westwood's list gives "567,"—almost certainly a clerical error.

29. 10. 25. ♀ = 383. Minas Geraës. (As 370.)

4. 11. 25. ♂ = 384. Minas Geraës. Near Nêpomucéna at Francisco Manoel's. "4th. Some tropeiros from the rancho seeing me catching Papilionidæ, caught a few also for me. I afterwards ascended the hill into the forest northward of our Rancho and took insects, till wet through in a thunder shower."

7. 11. 25. ♂ = 385. Minas Geraës. Near Nêpomucéna. On Nov. 6th Burchell was at Capitão Leite's."

15. 2. 26. 2 ♂ = 386, 387. Organ Mountains, near R. Pacaquê. "Along the road, $1\frac{1}{2}$ miles S. of the house."

Bz. + 28. 2. 26. ♀ = 388. Organ Mountains. "On the Rio Magé."

7. 3. 26. ♂ = 389. Rio. "At Catombí."

Bz. 10. 3. 26. ♂ = 390. Rio.

10. 3. 26. ♀ = 391. Rio.

12. 3. 26. ♂ = 392. Rio. Carioca Aqueduct.

Bz. a 13. 3. 26. ♂ = 393. "From Magé." Rio.

Bz. 19. 3. 26. ♂ = 394. Rio. "In the valley of Catombí."

19. 3. 26. ♂ = 395. Rio. "In the valley of Catombí."

Bz. 20. 3. 26. ♂ = 396. Rio. "Along the Carioca Aqueduct."

20. 3. 26. 2 ♂ & ♀ = 397, 398. Rio. "Along the Carioca Aqueduct."

21. 3. 26. 3 ♀ = 399, 400, 401. Rio. "Along the Carioca Aqueduct."

Bz. 1. 4. 26. ♀ = 402. Rio. "In the valley of Catumbí."

1. 4. 26. ♂ = 403.

1367. 22. 4. 29. ♀ = 404. "Mas." "Porto Real [Naçionale], R. Tocantins. Although the word "Mas" is written upon the label, the specimen is a distinct female.

In addition to the clerical error noted under no. 382,

Westwood's "Morphides 1" includes one more individual captured 10. 3. 26 and another bearing the date "14. 1. 26 Laranjeiros." The Brazilian note-book shows that Burchell visited the valley on 14. 1. 26 and that his captures were "omnia insuper plantas." Furthermore the data of no. 404 appear under the next number of Westwood's Catalogue, while those of no. 405 appear under no. 404, as though there had been an accidental transposition at some later date. Error in the data of no. 404 is also rendered probable from the fact that all the other examples of the *achilleana* form were captured at or in the neighbourhood of Rio, while 22. 4. 29 indicates a locality much further north. The possibility of Burchell mistaking the females of two allied species for male and female of a single species must, however, also be borne in mind.

Morpho achilles, Linn., f. *helenor*, Cram.

31. 10. 27. ♂ = 405. "In sylva opaca." E. of Goyaz : Sapezal to C  mpo Al  gre.

1247. 5 p. 7. 9. 28. ♂ = 406. Between Jaragu   and Cavalcante ; near Rio Maranh  o : Fe Gu  rda M  r. Burchell slept that night at Fe Gu  rda M  r. "*Papilio*. This species hovers low among the brushwood in shady deep forests and is not easy to catch."

Bz. + 6. 4. 29. ♂ = 407. Porto Real (Na  ionale).

6. 4. 29. ♂ = 408. " "

Bz. + 7. 4. 29. ♂ = 409. " "

Bz. + 3. 6. 29. ♂ = 410. Rio Tocantins : N. of Sitio das Pedras and Bai  o.

7. 7. 29. ♀ = 411. Par  . "Eastward of my house."

Bz. + 29. 7. 29. ♀ = 412. Par  . Westwood's label on this specimen refers to M (Morphides) no. 5 of his Catalogue, which reads 27. 7. 29, doubtless a mistake in copying.

Bz. + 31. 7. 29. ♂ = 413. Par  .

7. 8. 29. ♂ = 414. Par  .

6. 9. 29. ♂ = 415. Par  , S. Jos  . "Walk [to] a rocinha near the Nazareth Church."

15. 12. 29. ♂ = 416. Par   : "suburban  ."

In addition to the points mentioned after no. 404 and the clerical error in the case of 412, Westwood's list also differs in containing a specimen dated 1. 7. 29, when Burchell was at Par   and took a "walk to the Caza de Pao." Westwood arranged the specimens under four numbers, Morphides 2-5, but subsequently bracketed all except 5 (containing only

no. 412), and noted of them, "Similar to No. 1, but fascia more distinct and reaching nearly to hind margin of h. w."

31

V. BRASSOLINÆ.

Dasyophthalma creusa, Hübn.

9. 2. 26. ♂ = 417. Organ Mountains. "By the river Pacaqué."

9. 3. 26. ♀ = 418. Rio.

No data. ♂ = 419.

Westwood's list agrees, but he separated the males and the female under different numbers.

Dasyophthalma rusina, Godt.

8. 2. 26. 2 ♂ = 420, ♀ = 421. Organ Mountains, near head of R. Pacaqué. "In a ride to the Cattle Pounds and the Milho Reça."

"♀? vel var. fasc. alar. ant. antea recurva." Westwood's note.

9. 2. 26. ♂ = 422. Organ Mountains. (As 417.)

11. 2. 26. 2 ♂ = 423, 424. Organ Mountains. "By the River Pacaqué." "In a walk to the Ipé trees."

On 424 Westwood's note reads "*Dasyophthalma Rusina* Godt G D L 56. *Lycaon* Lucas pl. 78." The reference is to Doubleday's and Westwood's 'Genera of Diurnal Lepidoptera,' London, 1850-2, vol. ii. pl. lvi. fig. 1 (*Pavonia rusina*).

14. 2. 26. ♂ = 425. Organ Mountains. Near R. Pacaqué. No data. 3 ♂ = 426-428

Westwood's list gives another specimen captured 14. 2. 26, and three more specimens without data.

Eryphanis polyxena, Meerb., = *automedon*, Cram.

1054. [17. 3. 26.] ♂ = 429. Rio de Janeiro. "Along the Carioca Aqueduct, and descending the high hill (mentioned 31. 1. 26 ["the high hill N.W. of and close to Carioca Aqueduct"]) into the valley of Catumbi." "Both these Papiliones were caught in the forest down the hill." The other "*Papilio*" was the Satyrine *Taygetis virgilia*, Cram., no. 350.

Westwood's list agrees: "*Opsiophanes*?" is written opposite the Catalogue number.

Caligo beltrao, Hübn.

10. 3. 26. ♂ = 430. Rio.

066. 1. 4. 26. ♀ = 431. Rio. "In the valley of Catumbi."

"*Papilio*. This is one of the twilight tribe, but flies

also by day, in the woods: whereas the other species nearly resembling it, flies only during twilight. The chrysalis of this (1066) is ovate and of a green hue, and hangs at one end. I saw many at the house of a collector for sale: and their form was thus [rough sketch inserted here] but larger (2 inches?)."

Westwood's list agrees.

Caligo teucer, Linn.

31. 10. 27. ♂ = 432. "In sylvia opaca." E. of Goyaz.

Westwood's list agrees.

Caligo ilioneus, Cram.

31. 12. 25. ♂ = 433. Rio. "Excursion to the summit of the Corcovado; from Catete and up the valley of Laranjeiros."

Bz. + 18. 1. 26. ♂ = 434. Rio. "In a walk to S. Christovão and Eugénio Velho."

10. 3. 26. ♂ = 435. Rio. Westwood's note reads "var. fascia al. ant. magis distincta."

Bz. + 4. 7. 29. ♂ = 436. Pará.

Nos. 434 and 436 form Westwood's "Morphides 9"; the other two are included in his "Morphides 10."

Caligo eurylochus, Cram.

Bz. + 1032. 10. 1. 26. ♀ = 437. Rio. "Praia Grande and S. João de Carahý." "*Papilio*. Flies only in the first part of the twilight, and makes its first appearance about 10 or 15 minutes after the sun has set. I never saw it by day. It frequents woods and woody places, flying within 6 feet of the ground. I have seen [it] at Rio in all the months, and once I saw one flying in Rua Quitanda."

The Rua Quitanda is one of the principal streets of Rio.

Bz. + 11. 1. 26. ♀ = 438. Rio. "At Laranjeiros."

Bz. 10. 3. 26. ♂ = 439. Rio.

Bz. + 18. 3. 26. ♀ = 440. Rio. "Along the Carióca Aqueduct."

Nos. 437 and 440 form Westwood's "Morphides 6," opposite which is written "*M. Eurylochus*?" The two remaining specimens fall into "Morphides 10," which also includes two missing specimens. Both bore the same data, viz. "1032. 14. 1. 26." The number 1032 evidently refers to the habits described for a different specimen and date under no. 437. On Jan. 14, 1826, Burchell collected ("omnia insuper plantas") in the Valley of Laranjeiros, Rio.

Opsiphanes batea, Hübn., = *didymaon*, Feld.

Bz. + 21. 2. 26. ♂ = 441. Organ Mountains; near the R. Pacaqué. "Along the road by the Rancho for $1\frac{1}{2}$ mile from the house."

12. 3. 27. ♂ = 442. "In silvis et silvaticis." Near S. Paulo; "Morumbý: walk to old house." The specimen has lost the abdomen and the pencil of hairs on the hind wing; but the scar and the base of the tuft are distinct.

Westwood's list omits no. 441.

[I do not think that *didymaon* can be kept specifically distinct from *batea*. In no. 442 the black margin is wider and extends nearly to the cell of the fore wing, so that this specimen would be called *didymaon* by those who separate the two species.—E. B. P.]

Opoptera (*Opsiphanes*) *syne*, Hübn.

17. 3. 26. ♀ = 443. Rio. (As 429.)

Westwood's list agrees.

Catoblepia (*Opsiphanes*) *berecynthia*, Cram.

Bz. + 14. 6. 29. ♀ = 444. Pará.

1399. 24. 7. 29. ♂ = 445. Pará.

Westwood's list gives the first date as 14. 6. 27,—doubtless a copyist's error. Both are placed as no. 5 of his Catalogue of *Hipparchia*, thus clearing up one of the difficulties in that part of the list (see p. 65).

Opsiphanes inviræ, Hübn.

Bz. 10. 3. 26. ♂ = 446. Rio.

9. 9. 29. ♂ = 447. Pará: S. José.

6. 1. 30. ♀ = 448. Pará.

Westwood's data agrees, but he fuses *inviræ* with *crameri* and places both as no. 18 of his Catalogue of Nymphalinae. He also includes an additional specimen of *crameri* with the data of no. 450.

Opsiphanes cassia, Linn., = *crameri*, Feld.

Bz. 1033. + Bz. 11. 1. 26 + 1033. 11. 1. 26. ♂ = 449. Rio "at Laranjeiros." "*Papilio*. This has exactly [the]: same habits as the preceding," namely *Caligo eurylodchus*, no. 437.

1033. 14. 1. 26. ♂ = 450. "Laranjeiros." Rio: "brought from and collected in the Valley of Laranjeiros. *Omnia insuper plantas.*"

Burchell's 1033 attached in his notebook to the date 11. 1. 26 evidently refers to the habits, stated under no. 449 to be the same as those of 437.

Brassolis astyra, Godt.

Bz. 25. 11. 26. ♂ = 451. "Mrs. Whitaker." Santos.

The data correspond to those given by Westwood, but the species was placed as no. 20* of his Catalogue of *Nymphalinae*.

Dynastor darius, Fabr.

3. 6. 27. ♂ = 452. "Antennæ sensim incrassatæ." Near S. Paulo.

Bz. + 5. 9. 27. ♀ = 453. "Cachoeira." Between Rio Pardo and Rio Grande.

Westwood's list agrees. The specimens are placed as no. 23 of his Catalogue of *Morphides*.

3 J

IV. *On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825-1830.* By J. C. MOULTON, of Magdalen College, Oxford.

VI. *NYMPHALINÆ.*

MR. J. C. MOULTON, of Magdalen College, Oxford, has at my suggestion continued Miss Cora B. Sanders's valuable account of the Brazilian *Rhopalocera* in the Burchell Collection. In our attempts to solve the numerous difficulties which have arisen I have had abundant evidence of the skill and untiring care which he has devoted to this most important and interesting work.

E. B. POULTON.

THE following paper forms the continuation of the valuable publications by Miss Cora B. Sanders, ending with No. V.

Brassolinæ, on pp. 72-75 (originally published in ser. 8, vol. i. (Jan. 1908) Ann. & Mag. Nat. Hist. pp. 33-42). The genera have been placed in the order of Godman and Salvin's Lepidoptera Rhopalocera in the 'Biologia Centrali-Americana.' As on previous occasions, much kind help has been afforded in the identification of several specimens by Mr. F. A. Heron, of the British Museum. The species of the genus *Anæa* were kindly determined for the Hope Department by Mr. Herbert Druce, F.L.S.

The arrangement of numbers and dates is carefully explained on pp. 37, 38. The following additional statements are quoted from p. 67:—"Notes, other than numbers and dates, written on labels attached to the specimens are placed between inverted commas immediately after the numbers in heavy type, and immediately before the locality." "When a specimen bears a number only, the date, recovered from Burchell's note-book, is placed between square brackets. 'a.' and 'p.' associated with the date stand for 'A.M.' and 'P.M.'"

One or more specimens of each species have been compared with the British Museum series, and in the case of any doubt with the Godman-Salvin Collection also.

Westwood's list of Burchell's Nymphalidæ, which corresponds to the subfamily Nymphalinæ, contains 101 numbers. All of these do not, however, refer to Nymphalinæ, as there are four numbers (N. 47, N. 47*, N. 55, and N. 56) devoted to two Danainæ (*Anosia erippus*, Cr., and *Tasitia gilippus*, Cr. (140-187), one (N. 39) to a *Libythea*, and two (N. 18 = 446-450, N. 20* = 451) to two Brassolinæ. On the other hand, copies of the data of the following Nymphalinæ have been obtained from his list of "Burchell's Acræa, etc.":—The numbers A. 5, A. 6, A. 7 refer to three species of *Eresia*, A. 11 to *Victorina stelenes*, Linn., A. 15, A. 16 to two species of *Colænis*, A. 19 to *Metamorpha dido*, Linn., A. 20, A. 22 to two species of *Dione*. The dates of the specimens under four numbers of the list of Acræinæ &c. are very incomplete; but two small slips of paper in Westwood's handwriting give a full list of the dates which should have appeared under two of these, namely *Dione juno*, Cram., and *Metamorpha dido*, Linn. It seems probable that there were two other lists, probably on slips of paper equally small, for the two remaining species, *Dione vanillæ*, Linn., and *Colænis julia*, F., and that these have since been lost. One date has been obtained from Westwood's list of Erycinidæ (E. 70, *Phyciodes dicoma*, Hew.) and one from his list of Morphinæ (M. 21, *Prepona*

antimache, Hübn.). Of the 101 numbers given, all are accounted for except two, viz. N. 20 and N. 73, the former of which mentions one specimen dated 21. 2. 26, and the latter five specimens dated 12. 3. 26, 7. 11. 25, 913. 25. 10. 25 (two specimens), 11. 2. 26. This last number, N. 73, enclosed in parentheses, is placed in the middle of the genus *Catagramma*, and Westwood had written this name opposite the number, but afterwards erased it. These six specimens are unfortunately as yet untraced. Westwood's list of Nymphalinae is written in a clerk's handwriting, with notes as to names, including in a few cases a rough description, in Westwood's manuscript.

All obscure localities have been defined with reference to the map given on Plate I. accompanying the Introduction to the Collections of W. J. Burchell by Professor E. B. Poulton, F.R.S. (see pp. 1-12). J. C. MOULTON.

Oxford,
March 20th, 1908.

Protoponius drurii, Butl.

p. 2. 10. 27. = 454. Lanboso to Brêjo. Between Rio Corumbá, near Catalão, and Bomfim.

Westwood's date agrees with the above, but he gives the name *Protoponius Hippona*.

Hyppna clytemnestra, Cram.

Bz. 188. I. [8. 9. 25]. = 455. Rio de Janeiro. "*Pa-pilio*. Along the Aqueduct."

30. 10. 25. = 456. Minas Geraës. "(In the forest). On the N.E. side of the arraial of São João de Nêpomucéna."

7. 11. 25. = 457. Minas Geraës.

24. 12. 25. = 458. Rio de Janeiro. "Aqueduct (on the first hill on the left)."

29. 12. 25. 2 = 459, 460. Rio. "Catombí—Barra Vermelha—and Rio Comprido." Westwood's list gives another captured on this date.

14. 1. 26. = 461. Rio de Janeiro. "Brought from and collected in the Valley of Laranjeiros. Omnia insuper plantas."

26. 1. 26. 5 = 462-466. Morro de Ladéira and Catombí. "In a botanical and entomological excursion to the Barra Vermelha, Morro de Ladeira, and Catombí." Westwood's list gives another of this date.

27. 1. 26. 7 = 467-473. Rio de Janeiro.

31. 1. 26. = 474. Rio de Janeiro. "Valley of Catombí"

and a high Mountain on the N.W. side of the Aqueduct."
 "All of this date were from off plants; mostly up the Valley of Catombi."

7. 3. 26. ♂ = 475, 476, 477. Rio de Janeiro. "At Catombi." Bz. + 7. 3. 26. 2 = 478, 479.

Westwood's list gives five more captured on this date.

9. 3. 26. 5 = 480-484. Rio de Janeiro.

Westwood's list gives two more captured on this date.

10. 3. 26. 5 = 485-489. Rio de Janeiro.

12. 3. 26. = 490. Rio de Janeiro. "Aqueduct."

15. 3. 26. 2 = 491, 492. Rio de Janeiro. "Catombi, in plantis."

16. 3. 26. = 493. Rio de Janeiro. "In the upper part of the valley of Catombi, and along the road thence to Rio Comprido and Matto Porcos."

19. 3. 26. 2 = 494, 495. Rio de Janeiro. "In the valley of Catombi."

20. 3. 26. = 496. Rio de Janeiro. "Along the Carioca Aqueduct."

21. 3. 26. = 497. Rio de Janeiro. "Along the Carioca Aqueduct."

1. 4. 26. = 498. Rio de Janeiro. "In the valley of Catombi."

Bz. + 1. 4. 26. = 499. Rio de Janeiro. "In the valley of Catombi."

Bz. 3. 4. 26. = 500. Rio de Janeiro. "Along the Carioca Aqueduct."

Except for the additions mentioned above, Westwood's list agrees. The name *Hypna Clytemnestra* has been added in his handwriting.

The possibilities of a mimetic association between this species and *Gynæcia dirce*, L., are noted under that species (pp. 97, 98).

Anæa halice, Godt.

Bz. 27. 1. 26. ♂ = 501. "Catombi." Rio de Janeiro.

31. 1. 26. ♂ = 502. Rio de Janeiro. (As 474.)

7. 3. 26. 3 ♂ = 503, 504, 505. Rio de Janeiro. "At Catombi."

10. 3. 26. 2 ♂ = 506, 507. Rio de Janeiro.

Westwood's list gives this as *Paphia*, a synonym of *Anæa*, and his dates agree.

Anæa phidile, Hübn.

14. 2. 26. ♂ = 508. Organ Mountains.

7. 3. 26. ♀ = 509. Rio de Janeiro. "At Catombi."

Bz. 13. 3. 26. ♂ = 510. Rio de Janeiro.

Bz. 1. 4. 26. ♀ = 511. „ “In the valley of Catumbi.”

Bz. + 25. 8. 27. ♂ = 512. Ollaria to Rio Pardo.

27. 8. 27. ♂ = 513. Retiro. Just north of Rio Pardo.

p. 24. 8. 28. ♂ = 514. At Retiro. “All caught hovering and feeding on the excrement of some carnivorous animal in the virgin forest at Retiro.” This is another Retiro between Goyaz and Jeraguá.

Westwood's list mentions one more of this date, and another individual captured 26. 1. 26, Rio de Janeiro. Opposite these numbers also he wrote *Paphia*.

Anæa amenophis, Feld.

Bz. + p. 26. 8. 27. = 515. R. Pardo to Cubatão. “Lepidoptera caught at the passage of the several streams this day.” It should be noted that this Cubatão is far north of the place of the same name visited by Burchell from 3. 12. 26 to 17. 1. 27.

Bz. p. 24. 8. 28. 2 = 516, 517. At Retiro. (As 514.)

p. 24. 8. 28. 2 = 518, 519.

Westwood's list places this species, “together with *Anæa ænomais*, Boisd., under the name *Paphia*, and mentions seven specimens captured p. 24. 8. 27; this is doubtless a copyist's error for p. 24. 8. 28, of which date there are six individuals, counting two of *Anæa ænomais*. It therefore appears that one individual has since been lost, either of *A. amenophis* or *ænomais*.

Anæa ænomais, Boisd.

p. 24. 8. 28. 2 = 520, 521. At Retiro. (As 514.)

See note on *Anæa amenophis*, Feld., above.

Anæa otrere, Hübn.

11. 2. 26. = 522. Organ Mountains—“(in a walk to the Ipé trees).”

The date in Westwood's list agrees. This and the remaining species of *Anæa* are given the generic name *Paphia*.

Anæa arginussa, Hübn.

Bz. p. 26. 8. 27. = 523. “In sylvia in excr.” R. Pardo to Cubatão. (As 515.)

p. 26. 8. 27. = 524. “In silva in excrem.” R. Pardo to Cubatão. (As 515.)

p. 26. 8. 27. = 525. "In sylva insuper excremen." R. Pardo to Cubatão. (As 515.)

A specimen = 526, with two English labels, p. 26. 8. 27. "In silva in excrem.," and a. 29. 8. 27. Cérvó, north of R. Pardo (a. 29. 8. 27) or R. Pardo to Cubatão (p. 26. 8. 27). As below or as 515.

a. 29. 8. 27. 3 = 527, 528, 529. Cérvó. "In the forest ascending the Morro de Batataes. *Papilionides*. In this forest Butterflies literally swarmed and thousands might have been caught in one day. I never saw such abundance in my life before."

Bz. + a. 29. 8. 27. = 530. Cérvó. As above.

Westwood's list gives four individuals captured p. 26. 8. 27 and six on a. 29. 8. 27: probably the sixth individual of a. 29. 8. 27 can be accounted for by specimen 533 of the next species (*A. appias*), not otherwise referred to by Westwood, while the fourth of p. 26. 8. 27 is obviously represented by one of the labels on 526.

Anæa appias, Hübn.

Bz. 22. 3. 26 b. = 531. Rio de Janéiro. "Along the [Carioca] Aqueduct, to the head of the Valley of Laranjeiros." See note to *Prepona amphimachus*, no. 539.

Bz. + 25. 8. 27. = 532. Ollaria to Rio Pardo.

Bz. a. 29. 8. 27. = 533. Cérvó. (As 527.)

Westwood's list does not include this last specimen with the others. It is probably entered under the last species, and accounts for the missing specimen of this date.

Siderone ide, Hübn.

Bz. 221. I. [19. 9. 25]. = 534. Rio de Janeiro. "*Papilio* (*Colias*). Caught in vicinity of Botafogo bay. Given me by Mr. Heatherly."

Westwood's name and date agree.

Siderone (Zaretas) ellops, Linn.

p. 24. 8. 28. = 535. At Retiro. (As 514.)

Westwood's date agrees.

The specimens stand under the name *Paphia*.

The series in the British Museum is placed under the generic name *Zaretas*, but in the Godman-Salvin Collection *Siderone* is retained. In their book this genus is divided into *Siderone A* and *Siderone B*.

Cœa acheronta, F., = *cadmus*, Cram.

Bz. + 898. I. 25. 10. 25. = 536. Minas Geraës.

"*P[apilio]*. At Discoberto, near João Pedro's house."

Bz. + 16. 2. 26. = 537. Organ Mountains.

Westwood's list gives three more specimens, captured 4. 11. 25, 10. 11. 25, 10. 1. 26 (Rio de Janeiro and neighbourhood).

Aganisthos orion, F.

Bz. + 31. 10. 25. = 538. Minas Geraës. "On the road between Nepomucena and Domingos Ferreira's."

Westwood's list includes three more specimens captured 10. 3. 26 Rio de Janeiro, 31. 8. 27 Veravúlia, between Rio Pardo and Rio Grande, 26. 1. 29 Porto Real (Porto Nacional). In his list Westwood gives Burchell's number 1297 under this last date, and we may therefore conclude that Burchell was speaking of *A. orion* in the following passage from his Brazilian note-book:—

"1297 *Papilio*. The nature of this seems carnivorous as it frequently returned and settled on the skin of the Porco do Matto." Mr. Oldfield Thomas, F.R.S., kindly informs me that two forms of Peccary (*Tayassu tajacu* and *T. albirostris*) occur in the locality and that either might be called "Porco do Matto."

Prepona amphimachus, F.

9. 3. 26. ♀ = 539. Rio de Janeiro.

Westwood's list places this species and *Prepona pheridamas*, Cram., under one number, N. 16, and includes another individual captured 22. 3. 26 *b*. On this latter date Burchell went "along the Aqueduct to the head of the Valley of Laranjeiros," and his Brazilian note-book on this date reads:—"Along the Carioca Aqueduct. Those marked *b* were purchased from some negro-insect-catchers, who caught them all in this spot, and almost all were alive when I bought them."

Prepona antimache, Hübn.

273. 4. 12. 28. = 540. Porto Real [Nacional]. "Walk to the Igarapé"; and his Brazilian note-book has the following passage in reference to this number:—" *Papilio*—In the forests by the Iguapé *, hovering low between the brushwood."

* The spelling differs in Burchell's two note-books.

Burchell gives a similar note on a specimen (406) of *Morpho achilles*, L., caught 5 p. 7. 9. 28 between Jeraguá and Cavalcanti, a little south of Porto Real. It reads thus:—“*Papilio*. This species hovers low among the brushwood in shady deep forests and is not easy to catch.” The general resemblance of the upperside of this *Prepona* and its congeners to *Morpho achilles*, L., suggests a possible mimetic association between the two, which is still further borne out by this note of Burchell’s as to the similarity of their habits. The broad iridescent blue band which is so characteristic of both is probably the one conspicuous feature when they are on the wing, and thus an enemy would be less likely to notice the difference in size.

Westwood placed this date, without 1273, in his list of Morphinae, but corrected the mistake afterwards, writing “an var. Nymph. 16”, which refers to 539 and 541.

Prepona pheridamas, Cram.

Bz. + 855. I. 24. 10. 25. ♂ = 541. Minas Geraës. “*Papilio*]. About João Pedro’s, at Discoberto: at the margin of the forest.”

See note on *Prepona amphimachus*, no. 539. This specimen bears two English labels as well as one Brazilian.

The underside of this specimen differs in a remarkable way from that of any individual of the same species in either the British Museum, Godman-Salvin, or Hope Collections. The upperside is, however, identically the same, and the fact that the closely related genus *Charaxes* is extremely variable on the underside also supports the conclusion that the specimen is merely an interesting variety. This view is endorsed by Mr. R. Trimen, F.R.S., who has very kindly examined the specimen. Being unrepresented in any of the above-mentioned collections, a brief description may be of interest:—

Underside. Reddish ochre, with centre rather lighter. *Fore wing*: from base to apex of cell two patches of ground-colour bordered externally by white margins, succeeded by a thin, zigzag, dark brown line; a third patch follows this one, bordered first by a thin brown line, then again by a white edging, a combination which continues downwards to the first median nervule. *Hind wing*: central portion, ground-colour mixed with white, giving a striolated appearance. From junction of costa and hind margin to nearly halfway along the second radial nervule a darker patch of ground-colour joining hind margin and continuing to a point at end of third median nervule. An ill-defined trace of band of

ground-colour bordered by thin zigzag brown line and white edging starts from costa, losing itself in central portion at median nervure. Between each nervule and in a line parallel to the hind margin six ill-defined white spots; the sixth, between the second and first median nervules, is larger, not so white, and has a brown spot in the centre. The remainder of the hind margin to anal angle is of the lighter tint.

Compared with an average specimen presented by Godman and Salvin to the Hope Collection the following are the chief points of difference:—The whole ground-colour is a greenish-ochre; the brown lines, many of which are so thin and indistinct in Burchell's specimens, are much more marked in the ordinary type; in the hind wing the band of ground-colour is bounded by a dark line which is prolonged beyond the third median nervule across the second and first almost to anal angle, and followed by the white all the way. The white spots of Burchell's specimen are, however, hardly traceable in the type. Again, the brown spot in discoidal cell is far more strongly marked in both wings than in the variety, in the hind wing of which it is, indeed, necessary to use a lens to find any trace of this discocellular spot. Against this, however, the brown spot in the lower part of the hind wing is hardly traceable in the type. The central portion of the hind wing is also less occupied by lighter colour, inasmuch as the ground-colour from base and hind margin converges more towards the centre than in this interesting variety.

Chlorippe agathina, Cram.

Bz. + 2 p. 5. 5. 29. ♂ = 542. On the Rio Tocantins, north of Porto Real (Nacional). "Red Clay-slate cliffs", at Sucuri.

Westwood's list agrees. He gives the name as *Apatura*.

Chlorippe vacuna, Godt.

12. 3. 26. ♂ = 543. Rio de Janeiro. "Aqueduct."

13. 3. 26. ♂ = 544. "

13. 3. 26. ♀ = 545. "

Against this last specimen Westwood wrote "*Apatura* ♀?", and he had separated it as a different species under another number.

a. 24. 8. 28. ♂ = 546. At Retiro (between Goyaz and Jeraguá). "All at the rivulet near the house at Retiro."

Westwood's list reads a. 24. 8. 27, which is obviously a clerical error for this date. His dates otherwise agree. He

placed this species under the same number as 542, with the generic name *Apatura*.

546 is very like the other 2 ♂♂ of Burchell's series, but differs from them and a series in the British Museum from Brazil and Paraguay in this respect, namely, that the sub-apical brown spots are much smaller and more separated. There are no ♀♀ in the Godman-Salvin Collection, but the ♂♂ in it agree with specimens 543, 544 mentioned above.

Chlorippe laurentia, Godt.

a. 29. 8. 27. 5 ♂ = 547-551. Cérvó. (As 527.)

Bz. + 30. 8. 27. ♂ = 552. Between Rio Pardo and Rio Grande. "On the road between Paciencia and Veravinha."

Westwood's list gives these under the name *Apatura*, and his dates agree.

Chlorippe linda, Feld., = *plesaurina*, Butl.

Bz. + 25. 8. 27. ♂ = 553. Ollaría to Rio Pardo.

Bz. + 12. 4. 29. ♂ = 554. Porto Real (Nacional).

9. 5. 29. ♂ = 555. Near Alcántara on the Rio Tocantins, S. of Carolina. "(See the view—with the boat.)"

Westwood's list agrees, and he named these *Apatura* also.

Chlorippe linda, Drury, a mimic of *Adelpha nea*, Hew.

On the upperside this *Chlorippe* departs in both sexes from the usual pattern and colouring of its genus, and assumes the regular *Adelpha* pattern of white band, breaking into orange in the fore wing, on a dark brown background. Of the three specimens caught by Burchell, two were taken a little south of Pará. These exactly resemble in pattern a single specimen of *Adelpha nea*, Hew., also taken by him at Pará, though three months later. The chief points to be noticed are:—the shape of the orange band in the fore wing, which is pinched in at the apex of the discoidal cell in *nea*, while in *linda* the apical portion is separated by a narrow interval from the rest of the band. The white band, however, continues downwards of exactly the same width and shape, and the orange patch at anal angle in *nea* is reproduced in *linda* by a rather narrower streak. The shape of the fore wing of *linda* is rather less hooked than in the other species of *Chlorippe*, thus following the straighter hind margin of the *Adelpha*. We may thus safely conclude that *Adelpha nea*,

Hew., which possesses a typical *Adelpha* pattern, is the model, and that *Chlorippe linda*, Drury, which departs so much from the true *Chlorippe* pattern, is the mimic. Another point worthy of notice is the prolonging of the white band of the hind wing well into the fore wing in Burchell's third specimen of *Chlorippe linda*, caught (25. 8. 27) two years earlier a good deal further south near the Rio Pardo. On this very date Burchell caught a specimen of *Adelpha* nr. *abia* (no. 601), in which a noticeable feature is that the white band is prolonged well into the fore wing. Although this latter species is much smaller than *Adelpha nea*, it seems possible that its presence in the south influences the southern *Chlorippe linda* by drawing it away from its northern model, *Adelpha nea*, in this one characteristic.

It should be noted that the mimicry does not extend to the undersides, which are very different.

Adelpha erotia, Hew., form of or species very near.

Bz. 9. 3. 26. = 556. Rio de Janeiro.

Westwood's date agrees. He had named this *Heterochroa lerna*. The generic name is a synonym of *Adelpha*, and is used in the British Museum.

No. 556 appears to be nearest to two specimens from British Guiana in the Godman-Salvin Collection, and it resembles in a lesser degree a long series from S. Paulo, Paragnay, &c. unnamed in the same collection. Burchell's specimen is perhaps the same as *A. phylacides*, Stdgr., from the Upper Amazons, also in Godman-Salvin Collection. In the British Museum the nearest approach to it is *A. thesprotia*, Feld., which most resembles the Godman-Salvin specimens from Paraguay.

Adelpha cocala, Cram.

31. 1. 26. = 557. Rio de Janeiro. (As 474.)

Westwood's date agrees. This he had named *Heterochroa Cocala*, var.

Adelpha cytherea, Linn.

Bz. 191. I. [8. 9. 25]. = 558. Rio de Janeiro. "*Papilio*. Along the Aqueduct."

4. 11. 25. 2 = 559, 560. Minas Geraes. At Francisco Manoel's. "Some tropeiros from the rancho seeing me catching Papilionidæ, caught a few also for me. I afterwards ascended the hill into the forest northward of our Rancho and took insects, till wet through in a

thunder shower. In the evening caught some insects by the candle."

24. 12. 25. = 561. Rio de Janeiro. "Aqueduct (on the first hill on the left)."

9. 3. 26. = 562. Rio de Janeiro.

10. 3. 26. = 563.

Bz. 12. 3. 26. 3 = 564, 565, 566. Rio de Janeiro. "Aqueduct."

12. 3. 26. = 567. Rio de Janeiro. "Aqueduct."

Westwood's list adds another specimen captured on this date.

13. 3. 26. = 568. Rio de Janeiro.

15. 3. 26. = 569. " " "Catombi, in plantis."

18. 3. 26. 2 = 570, 571. " " "Along the Carioca Aqueduct."

20. 3. 26. 2 = 572, 573. " " "Along the Carioca Aqueduct."

Bz. 20. 3. 26. = 574. " " "Along the Carioca Aqueduct."

21. 3. 26. = 575. " " "Along the Carioca Aqueduct."

Bz. 21. 3. 26. = 576. " " "Along the Carioca Aqueduct."

Westwood's list adds another specimen captured on this date.

Bz. 22. 3. 26. 2 = 577, 578. Rio de Janeiro. Along the Aqueduct, to the head of the Valley of Laranjeiros.

1. 4. 26. = 579. Rio de Janeiro. "In the valley of Catumbi."

3. 4. 26. 2 = 580, 581. Rio de Janeiro. "Along the Carioca Aqueduct."

7. 6. 29. = 582. Sta. Anna. (On the Rio Tocantins, between Baio and Pará.)

Bz. + 1. 7. 29. = 583. Pará; walk to the Caza de Pao.

1. 7. 29. = 584. " " "

Bz. + 4. 7. 29. = 585. Pará. " " "

20. 9. 29. = 586. Pará. S.E. of S. Joze.

Westwood's list of this species under the name *Heterochroa* adds one more individual captured in Minas Geraës 7. 11. 25. Except for the above additions his dates agree.

Adelpha mythra, Godt., = *zeba*, Hew.

8. 2. 26. 2 = 587, 588. Organ Mountains. " (In a ride to the Cattle Pounds and the Milho Roça.)"

Westwood had written "*Heterochroa*, same as N. 27"

opposite "N. 53," under which stands one of the two preceding specimens. On 583 he had written "*Het. Dionysa* Hewits? Ann."

11. 2. 26. 2 = 589, 590. Organ Mountains. (In a walk to the Ipé trees.)

Under "N. 27" Westwood had written *Heterochroa Mithra*, and his dates agree.

Adelpha syma, Godt.

9. 2. 26. 4 = 591-594. Organ Mountains. " (By the river Pacaqué.)"

11. 2. 26. = 595. Organ Mountains. (As 589.)

This date had been originally written in a clerk's handwriting in Westwood's list of *Adelpha mithra*, but corrected to this species by Westwood himself.

12. 2. 26. = 596. Organ Mountains.

14. 2. 26. 2 = 597, 598. Organ Mountains.

10. 2. 27. = 599. S. Paulo. "Along the great Rio road for about 2 miles N.E."

18. 6. 27. = 600. Vicinity of S. Paulo.

Westwood's name and dates agree.

Adelpha sp. near *abia*, Hew., and perhaps a form of this species.

25. 8. 27. = 601. Ollaíto to Rio Pardo.

a. 29. 8. 27. = 602. Cérvó. (As 527.)

30. 10. 27. = 603. Sapezal to Conceição, near Goyaz.

Westwood's list agrees, and the name *Heterochroa* is written opposite. These forms resemble a series, unnamed, in the British Museum. Compared with the Godman-Salvin Collection they closely resemble some specimens placed under *Adelpha abia*, Hew.

Adelpha abia, Hew.

27. 8. 27. = 604. R. Pardo to Retiro.

a. 29. 8. 27. 4 = 605-608. Cérvó. (As 527.)

9. 9. 27. = 609. Penémé (just N. of the Rio Grande).

a. 24. 8. 28. = 610. Retiro. "All at the rivulet near the house at Retiro." (Between Goyaz and Jeraguá.)

25. 8. 28. = 611. Retiro to Goyavéira. "On the road." Near Goyaz.

Westwood's list adds another specimen captured p. 24. 8. 28 at Retiro. (As 514.) These he had named *Heterochroa Abia*.

Adelpha gerona, Hew.

25. 8. 27. ♂ = 612. Ollaríá to Rio Pardo.

Westwood's list gives this as *Heterochroa Gerona*, and his date agrees.

This specimen has a wider white band than the single specimen (♂) in the British Museum, which is Hewitson's type. There are none in the Godman-Salvin Collection.

Adelpha iphiclea, Linn.

20. 3. 26. = 613. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. + 3. 4. 26. = 614. „ "Along the Carioca Aqueduct."

A Westwood's label on this specimen bears the following note:—"Het. *Iphiclea* Linn. Drury 1 pl. 14 var. *Basilea* Cr. 188."

Bz. + 24. 3. 29. = 615. Porto Real (Porto Naçionale). Mánga.

Westwood's name is *Heterochroa Iphiclea*, and his dates agree.

Adelpha lerna, Hew.

7. 9. 27. ♂ = 616. Cachoéira to Retiro. This is a third Retiro, probably quite close to the Rio Grande, as in Burchell's 'Catalogus Geographicus' the following entry is given for the next day:—"Cachoéira to Rio Grande."

Westwood's name is *Heterochroa Lerna*, and his date agrees.

Adelpha plesasure, Hübn.

13. 3. 26. = 617. Rio de Janeiro.

21. 3. 26. = 618. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's dates agree, and he had identified the genus as *Heterochroa*.

Adelpha serpa, Boisd.

27. 1. 26. ♂ = 619. Rio de Janeiro.

8. 2. 26. ♂ = 620. Organ Mountains. "In a ride to the Cattle Pounds and the Milho Rega."

Bz. 10. 3. 26. ♂ = 621. Rio de Janeiro.

20. 3. 26. ♀ = 622. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's list agrees, and he names the species *Heterochroa Serpa*. His label on 620 bears the following note:—"*H. Serpa* Bdv. *Iphiclus* Cr. 188."

Adelpha nea, Hew.

7. 8. 29. ♀ = 623. Пара́.

Westwood's date agrees, and against this he had written "*Heterochroa* *Nea* var.?" A note on the mimetic association between this species and *Chlorippe linda*, Feld., is given under that species on pages 84, 85.

Pyrrhogyra crameri, Auriv.

Bz. + 22. 4. 29. = 624. Porto Real (Nacional).

Westwood's date and generic name agree.

Pyrrhogyra tipha, Linn., = *neærea*, Linn.

$B_z + 22.4.29. = 625.$ Porto Real (Nacional).

22. 4. 29. 2 = 626, 627.

Westwood's date and generic name agree.

Timetes (Megalura) chiron, F.

Bz. 559. II. [19. 10. 25]. 2 = 628, 629. Minas Geraes.
 "Pap[ulio]."

Bz.+ 903. *V.* 25. 10. 25. 4=630-633. Minas Geraes.
"P[apilio]. At Discoberto, near João Pedro's house."

Westwood's list adds another specimen of this date.

Bz. + 996. I. 27. 10. 25. = 634. Minas Geraes. "*Pap [ilio]*. At San João de Nepomucéna and on the road from Discoberto."

2S. 10. 25. 4 = **635-638**. Minas Geraës. "In the Forest on the West and on the East side of S. João de Nepomucena."

Westwood's list adds two more specimens captured on this date.

29. 10. 25. 2=639, 640. Minas Geraës. "In the forest on the S.E. side of S. João de Nêpomucéna."

4. 11. 25. 5 = 641-645. Minas Geraes. (As 559.)

Bz. 12. 3. 26. = 646. Rio de Janeiro. "Aqueduct."

Bz. 16. 3. 26. = 647. Rio de Janeiro. "In the upper part of the valley of Catombi, and along the road thence to Rio Comprido and Matto Porcos."

Bz. 3. 4. 26. = 648. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. 28. 11. 28. = **649**. Porto Real (Nacional).

27. 5. 29. = **650**. Arróyos; on the Rio Tocantins, between Itabóca and Baião.

Westwood's list omits one specimen dated 29. 10. 25, but adds another with the date 24. 10. 25. It is probable that "24" has been accidentally written for "29." Opposite this species Westwood had written "*Timetes Chiron*, Fab.; *Marius*, Cram."

Timetes (Megalura) coresia, Godt.

9. 2. 26. 2 = **651, 652**. Organ Mountains. (By the River Pacaqué.)

Westwood's date agrees, and he identified the species as *Timetes Coresia*. On **651** he gives a label bearing the words:—" *Timetes Coresia* Godt., *Zerynthia*, Hb."

Timetes (Marpesia) peleus, Sulz.

4. 11. 25. 2 = **653, 654**. Minas Geraës. (As **559**.)

Westwood's list gives another specimen captured on this date.

p. 24. 8. 28. = **655**. Retiro. (As **514**.)

Westwood's dates agree, and he names this *Marpesia Thetys*, a synonym of *peleus*.

Amphirene (Sipræta) trayja, Hübn.

27. 8. 27. = **656**. Retiro. (Just north of Rio Pardo.)

Westwood's date agrees, and he gives the name as "*Minetra Trayja*."

Victorina stelenes, Linn.

Bz. + a. 29. 8. 27. = **657**. Cérvó. (As **527**.)

Westwood's date agrees, though this appears under his list of *Acræinæ*. Opposite the number he had written:—" *Junonia*? brown with green spots."

Cystineura apicalis, Stdgr., n. subsp. *burchelli*.

Bz. 23. 3. 28. ♂ = **658**. Goyaz. Sitio of Zacharíá.

Westwood's list makes this date to be 23. 4. 28.

Bz. 19. 9. 28. ♀ = **659**. "Sylv. Tucantins." Rio Tucantins.

Bz. 16. 2. 29. ♀ = **660**. Porto Real (Nacional). "Papiliones (3) caught on the flowers of a *Malva* in the back yard."

Col. Prain informs me that no specimen of this *Malva* exists in Burchell's Herbarium at Kew.

Bz. 22. 3. 29. ♀ = 661. Porto Real (Nacional).

24. 3. 29. ♂ = 662. Porto Real. Mánga.

Westwood's list agrees, except that it also includes 663.

This form is unrepresented in the British Museum and Godman-Salvin Collection. It may be regarded as a northern subspecies of *C. apicalis*, Stdgr., described as a South Brazilian insect.

Cystineura apicalis, Stdgr., n. subsp. *burchelli*.

Female (no. 661). Central ground-colour white, surrounded by fuscous-brown margins; some dull orange in apical area of fore wing. *Fore wing*: from base towards apex a broad costal fuscous border covering discoidal cell; beyond end of cell a white kidney-shaped spot, succeeded by apical fuscous patch, which itself encloses diffused dull orange in the centre; from the fourth subcostal nervule and in the centre of the orange patch a series of four internervular spots of fuscous ground-colour, with white centres increasing in size towards the last. Central portion of wing occupied by triangular patch of white, widening from third median nervule to inner margin. Two irregular, oblong, faint, white spots in discoidal cell running into ground-colour, with very slight trace of a third over the junction of the two. Hind margin with a border of rather darker fuscous, slightly serrated on inner side. Cilia white between nervules. *Hind wing*: subcostal band of fore wing continued across base of hind wing, succeeded by central patch of white. Hind-marginal band of fuscous rather broader than in fore wing; the actual margin marked by a darker line, preceded by an interrupted faint whitish line, both following the serration of the wing. From centre of inner margin to costa beyond middle a narrow, nearly straight, fuscous band, which almost loses itself in the white central patch at the second subcostal nervule, but continues again, indistinctly and slightly narrower, from the first subcostal nervule. Cilia as in fore wing.

Underside dull orange and white. *Fore wing*: same band from base towards apex as on upperside, dull orange instead of fuscous, marked by similar (but better defined) irregular white spots, and succeeded by rather larger kidney-shaped white spot, which is enclosed in the apical orange patch. A row of five white spots from costa between nervules to second median nervule, their central portion white as on upper surface, but better defined. Hind margin marked by

thin dark line, internally relieved by small indistinct white lunules. *Hind wing*: dull orange patch at base in continuation of band in fore wing. White central patch with dull orange band from inner margin to costa, broken, however, between first and second subcostal nervules. Hind-marginal band of dull orange, broadening at centre and narrow again at anal angle, more serrated than in fore wing and bounded by darker thin line relieved internally by larger white lunules.

Male (no. 662) differs slightly from the female in size, being rather smaller and having rather more pointed fore wings. Also the kidney-shaped white spot under the costa in the fore wing is a little smaller. On the underside the central patch of white in the fore wing is extended nearly to the apex, leaving only a narrow border of ground-colour lining the apex and hind margin. In the hind wing the dull orange band is continuous instead of being broken between first and second subcostal nervules as in female. In other respects the markings of the male are the same as in the female.

Type ♂ of *burchelli*, specimen 662, and type ♀, specimen 661, in Hope Department, University Museum, Oxford.

Distribution (based on the five specimens captured by Burchell). From Goyaz northwards to Porto Real (Nacional) on the Rio Tocantins: the interior of Eastern Brazil.

These differ from the series of *Cystineura apicalis*, Stdgr., in the British Museum and in the Godman-Salvin Collection chiefly in the absence of a large apical patch of dull orange in fore wing, which is characteristic of all specimens in those collections.

In two specimens from Casa Branca, S. Paulo, in the Godman-Salvin Collection the fuscous band in the hind wing is broader than in *apicalis* and is of equal width throughout. In depth of colour it resembles the hind-marginal border. The dull orange apical patch extends from the kidney-shaped white spot below the costa to the first median nervule, leaving a narrow serrated border to the hind margin. The white spots on the underside are less marked than in *burchelli*.

In six from Chapada, also in the Godman-Salvin Collection, the fuscous band across the hind wing tapers towards the costa as in *burchelli*, and in one individual is broken between the first and second subcostal nervules.

Two specimens from Paraguay (captured 1904 and 1905) in the British Museum have a more slate-coloured appearance, which is even more accentuated in two very fine specimens from Coroico, Bolivia, in the Godman-Salvin

Collection. With the aid of a lens it is at once seen that this is due to a fine dusting of white scales on the fuscous ground-colour. These seem to disappear in older specimens. The above-mentioned two specimens from Paraguay have a rather broader fuscous band in the hind wing, and in one female from Santa Cruz, Upper Paraguay River, the white in both wings is reduced to form two narrow bands.

Cystineura tocantina, Bates.

1316. 17. 2. 29. = **663**. Porto Real (Nacional). "Feeding on the flowers of the *Waltheria* bushes (v. II. 8632 x)." Col. Prain, F.R.S., kindly informs me that Burchell's

"8632-2" is named *Waltheria ferruginea*?, St. Hil., in the herbarium. Burchell's botanical catalogue contains these words:—"8632-2 *Waltheria* v. Cat. Entomol. Frutex 5-7-ped. ramosus. Corolla citrina, vel sulphurea."

Included under *burchelli* in Westwood's list. His date agrees.

This is unrepresented in the British Museum, but has been compared with specimens in the Godman-Salvin Collection.

Didonis biblis, F.

Bz. 141. III. [16. 8. 25]. 2 = **664, 665**. Rio de Janeiro. "*Papilio*. Above the Teresa Convent; and on the woody hilly [hills] along the Aqueduct."

Westwood's list adds one more of this date.

4. 11. 25. = **666**. Minas Geraës. (As 559.)

6. 12. 25. = **667**. Rio de Janeiro. On the Corcovado Mountain. "In an excursion to the Summit of the Corcovado by the road by the Convent of Sta. Theresa and along the Aqueduct."

Westwood's list adds another of this date.

31. 12. 25. 2 = **668, 669**. Rio de Janeiro. On the Corcovado Mountain, and in the Valley of Laranjeiras. "Excursion to the summit of the Corcovado; from Catete and up the valley of Laranjeiros."

10. 1. 26. 2 = **670, 671**. Rio de Janeiro. Praia Grande and S. João de Carahý. "At Praia Grande and vicinity, and about S. João de Carahý."

26. 1. 26. = **672**. Rio de Janeiro. Morro de Ladéira and Catombi. "In a botanicaal and entomological excursion to the *Barra Vermelha*, *Morro de Ladéira*, and *Catombi*."

Westwood adds another of this date.

27. 1. 26. = **673**. Rio de Janeiro.

Westwood's list adds two more specimens of this date.

7. 3. 26. = 674. "Catombí," Rio de Janeiro. "At Catombí."
 7. 3. 26. = 675. Rio de Janeiro. "At Catombí."
Bz. 7. 3. 26. = 676. Another label attached to this specimen has the words:—"Duplicate Lepidoptera, selected from my Brazilian collection." Rio de Janeiro. "At Catombí."
Bz. 9. 3. 26. = 677. Rio de Janeiro.
 16. 3. 26. = 678. " (As 647.)
Bz. 16. 3. 26. = 679. " "
 27. 8. 27. = 680. Retiro. "Just north of Rio Pardo."
 30. 10. 27. = 681. Sapezal to Conceição; near Goyaz.
Bz. 25. 8. 28. = 682. Retiro to Goyavêira. "On the road." This Retiro is east of Goyaz, and the place mentioned on 514.

Westwood had written the name *Biblis*, and his list adds three individuals captured:—

14. 1. 26. Rio de Janeiro. "Brought from and collected in the Valley of Laranjeiros. Omnia insuper plantas."
 19. 3. 26. Rio de Janeiro. "In the valley of Catombí."
 20. 3. 26. Rio de Janeiro. "Along the Carioca Aqueduct."

Peridromia arethusa, Cram.

- Bz.* 194. I. [8. 9. 25]. = 683. Rio de Janeiro. Along the Aqueduct. "*Papilio*. In sylva."
 1068. [3. 4. 26]. = 684. Rio de Janeiro. Along the Carioca Aqueduct. "*Papilio*: totimque nigra supra maculis cæruleis, subtus maculis rubris. This settles on the sunny smooth trunks of trees." [Other butterflies bearing the same number are:—*Papilio hectorides*, Esp., 1; *Papilio torquatus*, Cr., subsp. *polybius*, Swains., 1.]
 1243. 7. 9. 28. 4 = 685-688. Rio Maranhão to Fe Guárda Môr. Between Jeraguá and Cavalcanti; near Rio Maranhão. "2 sp[ecies of] Papiliones caught against sunny side of trunk of a large tree on bank of the Maranhão. Wings expanded flat against the trunk."—"1243 conf. *Pap. arethusa*" [added later in pencil on blank page]. The other species is *Ageronia chloë*, Stoll.
Bz. + 1243. 7. 9. 28. = 689. Rio Maranhão to Fe Guárda Môr. As above.

Westwood's list gives two more specimens captured on this date. He gives the name "*Ang. Arete*" to one of the two numbers into which he had divided these specimens.

On 683 he had written "*Angerona Arete* Bdv. Lucas. *Arethusa* Cram. 77 nec *Arethusa* Hb. Samml."

Opposite Burchell's species of *Peridromia* and *Ageronia* Westwood has accidentally written for the latter name that of the Geometrid genus *Angerona*.

Peridromia amphinome, Linn.

Bz. 351. I. [15. 10. 25]. = 690. Minas Geraës. "At the Discobérto do Antonio Velho." "*P[apilio]*. This species and the following [*Peridromia feronia*, Linn.] settle on the smooth sunny bark of the trunks of large trees, and when in their flight they meet another of the same species they appear to fight, and at the same time produce with their wings an extraordinary and loud and quickly repeated crackling noise."

The same fact was observed seven years later by Charles Darwin, and recorded in his 'Journal of Researches &c.,' London, 1876, pp. 33, 34 (Rio de Janeiro, 1832):—

"I was much surprised at the habits of *Papilio feronia*. This butterfly is not uncommon, and generally frequents the orange-groves. Although a high flier, yet it very frequently alights on the trunks of trees. On these occasions its head is invariably placed downwards; and its wings are expanded in a horizontal plane, instead of being folded vertically, as is commonly the case. This is the only butterfly which I have ever seen, that uses its legs for running. Not being aware of this fact, the insect, more than once, as I cautiously approached with my forceps, shuffled on one side just as the instrument was on the point of closing, and thus escaped. But a far more singular fact is the power which this species possesses of making a noise. Several times when a pair, probably male and female, were chasing each other in an irregular course, they passed within a few yards of me; and I distinctly heard a clicking noise, similar to that produced by a toothed wheel passing under a spring catch. The noise was continued at short intervals, and could be distinguished at about twenty yards' distance: I am certain there is no error in the observation."

See also Lepidoptera Rhopalocera of the 'Biologia Centrali-Americana,' F. D. Godman, F.R.S., and O. Salvin, F.R.S., vol. i. pp. 267, 268.

12. 3. 26. = 691. Rio de Janeiro. "Aqueduct."

Bz. 20. 3. 26. 2 = 692, 693. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's list agrees, and the name he gives in it is *Angerona Amphinome*, Linn., which also appears in his handwriting on 691.

Peridromia feronia, Linn.

Bz. 352. I. [15. 10. 25]. = 694. Minas Geraës. "*P[apilio]*."

At the Discoberto do Antonio Vello.

See Burchell's note to no. 690, which refers equally to this individual.

28. 10. 25. = 695. Minas Geraës. (As 635.)

29. 12. 25. = 696. Rio de Janeiro. Catombí, Barra Vermelha, and Rio Comprido.

10. 1. 26. = 697. Rio de Janeiro. (As 670.)

14. 1. 26. = 698. " " "Brought from and collected in the Valley of Laranjeiros. Omnia insuper plantas."

27. 1. 26. = 699. Rio de Janeiro.

9. 3. 26. = 700. " "

10. 3. 26. = 701. " "

Bz. 15. 3. 26. = 702. " " "Catombi, in plantis."

Bz. 16. 3. 26. = 703. " (As 647.)

16. 3. 26. = 704. " "

22. 3. 26. = 705. " " "Along the Carioca Aqueduct" "to the head of the Valley of Laranjeiros."

1. 4. 26. = 706. " " "In the valley of Catumbi."

26. 9. 26. = 707. Santos. In a walk to the Chapel on Montserrat. "These *Papiliones* very plentiful in the woods. The *white-spotted* one settling on smooth bark on sunny side of trees, with outspread wings close to bark, and returning often to the same tree when disturbed."

1226. 16. 4. 28. = 708. Goyaz. Morro de Cantagálo. "*Papilio*. Settles with wings expanded against sunny side of trunk of tree in forest. Same manners and movements as its congeners."

23. 6. 29. = 709. Pará.

Westwood's list agrees, and he gives the name *Angerona Feronia*.

Peridromia epinome, Boisd.

28. 10. 27. = 710. S. Joaquim to Sapezal. Between Meia Ponte and Goyaz.

Bz. a. 24. 8. 28. = 711. At Retiro. (See 514.) "All at the rivulet, near the house at Retiro."

p. 24. 8. 28. 2 = 712, 713. At Retiro. (As 514.)

Westwood's list agrees, though he places this species with the next under the name *Angerona Ferentina*.

Ageronia ferentina, Godt.

Bz. + 29. 12. 25. = 714. On the Brazilian label is the following:—"Papiliones hujus generis insident in truncis nudis apricis." Rio de Janeiro, Catombí, Barra Vermêlha, and Rio Comprido.

14. 1. 26. = 715. Rio de Janeiro. (As 698.)

7. 3. 26. = 716. " " "At Catombí."

12. 3. 26. = 717. " " "Aqueduct."

Bz. 16. 3. 26. = 718. " (As 647.)

3. 4. 26. = 719. " " "Along the Carioca Aqueduct."

1. 2. 30. = 720. Pará. In the forest S.S.E. of S. Jozé.

Westwood's list agrees. On 720 he had written "*Angerona Ferentina*, Godt."

Ageronia chloë, Stoll.

1243-2. 7. 9. 28. 3 = 721-723. Rio Maranhão to Fe Guáda Môr. (As 685.)

Westwood's list and name agree, except that he writes the generic name as *Angerona*. On 722 he had written "*Angerona Chloe*, Stoll."

Gynæcia dirce, Linn.

10. 1. 26. 3 = 724-726. Rio de Janeiro. (As 670.)

Westwood's list gives another individual captured 7. 3. 26. Rio de Janeiro. "At Catombí." His name and dates otherwise agree.

The general resemblance on the upper surface between this species and *Hypna clytemnestra*, Cr., may prove to be of mimetic significance. On comparing the data on Burchell's specimens the following facts are evident:—Between Sept. 8th, 1825, and April 3rd, 1826, Burchell captured 54 specimens (by Westwood's list, see pp. 77-78) of *Hypna clytemnestra*, Cr., at Rio de Janeiro and its neighbourhood. Of these 46 can now be traced. In the same locality he took 4 specimens (of which we now possess 3) of *Gynæcia dirce*, L., on the two dates Jan. 10th, 1826, and March 7th, 1826. From Westwood's list we gain still further evidence that the two species are on the wing together; for he gives 10

specimens of *H. clytemnestra* caught March 7th, 1826, at Catombý, and one of *G. dirce* on the very same day. Five of the *clytemnestra* have unfortunately since been lost, as well as this single *dirce*.

The pattern, which consists of a dark fuscous background enlivened only by a broad yellow bar across the apex of the fore wing, stands out in each case from that which is found in the allied species. It is difficult, and perhaps impossible, to determine which of the two forms has acted as model; but in the case of *H. clytemnestra*, the species of the closely related genus *Protopogonius* are invariably, although roughly, mimetic. Thus *Protopogonius drurii* mimics *Heliconius narcæa*. Hence it becomes probable that this propensity for mimicry is extended to *H. clytemnestra*. Burchell's specimens of *clytemnestra* without exception exhibit three yellow spots just beyond the subapical band of the fore wing; and these are absent in *dirce*. However, on comparing a series of each in the Hope Collection from Paraguay, I observed that the spots were in some cases reduced in *clytemnestra* and correspondingly present in *dirce*, as if the mimetic association was stronger in that part of the country.

It must be further noted that this is only a case of upper-side mimicry. The underside of *clytemnestra* is procryptically coloured, apparently for concealment among dead leaves, while the bolder pattern of *G. dirce* is adapted for the protective resemblance to tree-trunks on which it rests with upright wings (H. W. Bates in *Lepidoptera Rhopalocera* of the 'Biologia Centrali-Americana,' F. D. Godman, F.R.S., and O. Salvin, F.R.S., vol. i. pp. 264-266).

Catagramma lyrophila, Hübn.

Bz. 286. I. [13. 10. 25]. = 727. Minas Geraës. Parahíba. "Papil[io] affinis præcedenti," viz. *Callicore clymena*, Cram.

Bz. + 912. I. 25. 10. 25. = 728. Minas Geraës. "P[apilio]. At Discoberto, near João Pedro's house."

12. 2. 26. = 729. Organ Mountains.

A date given as 12. 26 (omitting the month) in Westwood's list has probably been accidentally substituted for that of 729.

25. 8. 27. = 730. Ollaríá to Rio Pardo.

26. 8. 27. = 731. R. Pardo to Cubatão. (See 515.) "Lepidoptera caught on the riverside at the ferry of the Rio Pardo" (A.M.) or "at the passage of the several streams this day" (P.M.).

Bz. 27. 8. 28. = **732**. Goiaveira. Between Goyaz and Jeraguá. "All these Lepidoptera were caught at the ford of the rivulet at Goiabeira, at 5 P.M." This rivulet is evidently one of the head waters of the Rio Tocantins.

Westwood's list gives eight more additional specimens captured on this date. His list also refers to the following additional specimens, the dates of which have made it possible to recover the accompanying data:—

564. I. [19. 10. 25.] Minas Geraës. "*Pap[ilio]*."
 4. 11. 25. 2 specimens. Minas Geraës. (As **559**.)
 10. 11. 25. Minas Geraës.
 31. 1. 26. Rio de Janeiro. (As **474**.)
 9. 2. 26. Organ Mountains. (By the river Pacaquê.)
 9. 3. 26. Rio de Janeiro.
 12. 3. 26. " " "Aqueduct."
 a. 24. 8. 27. 2 specimens. Ollaria, just S. of the Rio Pardo.
 25. 8. 27. 5 specimens in addition to **730**.
 a. 26. 8. 27. 3 specimens. R. Pardo to Cubatão. (See **515**.)
 "Lepidoptera caught on the river side at the ferry of the Rio Pardo."
 27. 8. 27. R. Pardo to Retiro.
 11. 10. 27. 2 specimens. "To Fórna" (from the south).
 Between Meia Ponte and Bomfim.

Westwood noted these as belonging to the genus *Catagramma*, and on **727** he had written "*Hydaspes*. Drury iii. pl. 15 *Lyrophila* Hb. Zutr. 397." Burchell's specimens of *lyrophila* correspond well with a long series in the Godman-Salvin Collection from Rio de Janeiro, Minas Geraës, Chapada, and Paraguay.

Catagramma latona, Butl.

10. 4. 28. ♀ = **733**. Goyaz. Caminho de Carréira. "All caught in the Caminho da Carreira, beyond the Church of Sta. Barbara. The whole road being woody."

Westwood's list places this in the series of *Catagramma sorana*, Godt.

This specimen exactly resembles Butler's type in the Godman-Salvin Collection, but three specimens in the British Museum labelled "*C. latona*, Butl.," differ in having a narrower red subapical band.

Catagramma sorana, Godt.

- a. 26. 8. 27. = **734**. R. Pardo to Cubatão. (See **515**.)
 "Lepidoptera caught on the river side at the ferry of the Rio Pardo."

Bz. + p. 26. 8. 27. = **735**. R. Pardo to Cubatão. (See 515.) "Lepidoptera caught at the passage of the several streams this day."

Bz. + 30. 8. 27. = **736**. "On the road between Paciencia and Veravinha." (As 552.)

30. 8. 27. = **737**. "On the road between Paciencia and Veravinha."

Bz. a. 24. 8. 28. = **738**. Retiro. (As 610.)

Westwood's generic name agrees: his list also corresponds, except for the inclusion of **733** and the accidental substitution of two "a. 26. 8. 27" for one of this date and one of "p. 26. 8. 27."

Catagramma selima, Guénée.

Bz. + a. 26. 8. 27. ♂ = **739**. R. Pardo to Cubatão. (As 734.)

9. 9. 27. ♂ = **740**. Tenénte. Close to Rio Gránde.

Bz. + 24. 10. 27. ♂ = **741**. Meiaponte to S. Joaquim (Joaq. Alves).

Westwood's list adds another specimen captured on this date.

a. 24. 8. 28. 3 ♂ = **742-744**. Retiro. (As 610.)

27. 8. 28. ♂ = **745**. Goiaveira. (As 732.)

Westwood's list adds five individuals, captured a. 24. 8. 27 at Ollaria, just S. of R. Pardo, and omits the three captured a. 24. 8. 28. The discrepancy may, perhaps, be accounted for by the clerical substitution of "27" for "28" in the year of the date, in which case two specimens are still missing. His generic name agrees, and on **739** he had written "*Cynosura* ♀ Hew. Ex. Lep. f. 22, 23."

This species was compared with type in the British Museum. In the Hewitson Collection it stood under *C. cynosura*, Doubl. Hew. A series named *C. astarte*, Cr., in the Godman-Salvin Collection is also very similar, except that the markings on the undersides are rather heavier than in Burchell's specimens.

Catagramma cyllene, Dbl. & Hew.

Bz. 359. I. [15. 10. 25]. = **746**. Minas Geraës. "*Papilio*.

At the Discobérto do Antonio Velho. Aff. 285." By this number Burchell refers to *Callicore clymena*, Cr.

Bz. + 966. I. 26. 10. 25. = **747**. Minas Geraës. "*Papilio*." At Discoberto; near João Pedro's house."

Westwood's list and generic name agree, except for an obvious clerical error in the number of the last specimen,

which is given as 996. On 747 he had written "*C. Cyllene* Gen. D. L. Pl. 28 *Pygas* ♀ teste Hew. Cat. Iconogr."

Catagramma pygas, Godt., f. *thamyras*, Mén.

28. 4. 28. = 748. Goyaz. "Papiliones caught by C[ongo] at the Carioca spring." Congo was Burchell's native servant.

Westwood's list and generic name agree.

In the British Museum this is given as the *thamyras*, Mén., form of *C. pygas*, Godt. Four similar specimens from Chapada are unnamed in the Godman-Salvin Collection.

Catagramma pyracmon, Godt.

a. 26. 8. 27. 2 = 749, 750. R. Pardo to Cubatão. (As 734.)

Westwood's list adds two more captured on this date, one in the morning and the other in the afternoon.

Bz. 27. 8. 27. = 751. Rio Pardo to Retiro.

27. 8. 27. = 752.

Westwood's list adds an "individual captured 25. 8. 27, Ollaria to Rio Pardo, and another with a. 29. 8. 27, Cervo. (As 527.) He writes against this also the genus *Catagramma*.

Catagramma sp. near *peristera*, Hew.

3. 3. 28. = 753. Goyaz. "Caught in the town by the rio Vermelho; by C[ongo]."

Westwood's date and generic name agree.

This specimen bears a Westwood's label which is somewhat difficult to interpret, but almost certainly reads thus:—"Obs.[erve] plaga sang. alar. post.; [or the semicolon may be intended for "i" for "in"] forma diversa alar. post. An. sign. alb. necnon striola cærul. marg. al. post." It is obvious that "ant." should have been written in place of one "post.," probably the first. The "An" is probably intended for "Ant." Before "An" is a mark which may be Westwood's monogram or, perhaps, an erased letter.

This is probably a geographical subspecies of *C. peristera*, and compared with a long series from Bolivia, the Lower Amazon, New Granada, Ecuador, and Eastern Peru in the Godman-Salvin Collection, exhibits the following differences:—(i.) the red patch in hind wing is narrower than in the above-mentioned species; (ii.) the blue on the margin at anal angle is slightly more developed; (iii.) the hind-wing underside in Burchell's specimens has the yellow submarginal line of the same width from costa to anal angle, while in the

Godman-Salvin series this yellow line is widest at its costal end, and tapers off to the second median nervule, where it is interrupted by a black spot, and again by a second spot at the first median nervule.

Catagramma pasithea, Hew.

24. 3. 29. = **754**. Porto Real (Nacional). Mánga.
(5.?) 5. 29. = **755**. Red Clay-slate cliffs [at Sucuri] on the Rio Tocantins, north of Porto Real (Nacional).

Westwood's dates and generic name agree.

In a series in the Godman-Salvin Collection from Peru, the Upper Amazon, and Bolivia there is a thin blue submarginal line in the hind wing which is absent in Burchell's specimens, while there is also more red developed on the underside than in his specimens.

Callicore kolyma, Hew.

- Bz. 28. 4. 28. = **756**. Goyaz. (As **748**.)

Westwood's list gives two more individuals captured on this date.

27. 8. 28. = **757**. Goiaveira. (As **732**.)

Westwood's list makes this last date 27. 8. 27 instead of 27. 8. 28. He also places this and the following species of the genus *Callicore* among the *Catagrammas*.

On the underside the red marking at the base of both wings is much reduced in these two specimens, which correspond with a series of ten, half from Chapada and half from New Granada, in the Godman-Salvin Collection. But in ten from Ecuador and two from Peru and the Upper Amazon the red is more dominant. In the Hope Collection four specimens from Ecuador have the light blue submarginal line developed all along the hind margin; in one from the Upper Amazon it is only present for half the distance from the costa to the anal angle, while in these two Burchell specimens it is still further reduced to a small streak across the apex. On the underside this peculiarity is even more noticeable, the line being reduced to two small blue dots in **756** and absent altogether in **757**. Furthermore, in a series of five from S.E. Brazil in the Godman-Salvin Collection this line is only partially developed. On the upperside in three of these there is a well-marked red spot on the fore wing just beyond the apex of the discoidal cell, which is much less developed in Burchell's specimens and in the remaining two of the Godman-Salvin series of five.

Omitting the consideration of this last variable character in S.E. Brazil, it appears that the development of the red

patch at the base and the blue line at the hind margin are the chief characteristics of the western forms, and that both become more reduced as we follow the species south-eastwards, until, in extreme varieties, the blue line may be lost altogether (as in 757). Furthermore, the five specimens from New Granada indicate that a reduction of red similar to that of the east also occurs to the north.

Callicore candrena, Godt.

27. 8. 27. 2 = 758, 759. Rio Pardo to Retiro.

Bz. + 28. 8. 27. = 760. "Retiro." This locality on the specimen is confirmed by the Brazilian Note-book and the 'Catalogus Geographicus.'

Bz. 30. 8. 27. = 761. (As 552.) "On the road between Paciencia and Veravinha."

Bz. 27. 8. 28. = 762. Goiaveira. (As 732.)

27. 8. 28. = 763.

Westwood's list agrees, but includes an additional specimen captured on this last date, and another with the date 11. 2. 26. Organ Mountains (in a walk to the Ipé trees). On 758 he had written "*Catagr. Candrena* Hb., Zutr. 893, 894."

Callicore janeira, Feld.

Bz. + 12 a. 4. 5. 29. = 764. Funil; north of Porto Real (Nacional).

This specimen does not bear any of the numbers of Westwood's list of *Nymphalinae*, but it is probably referred to under *Callicore eluina*, Hew.

Callicore clymena, Cram.

Bz. 285. III. [13. 10. 25]. = 765. Minas Geraës. Parahíba. "*Papilio* . . . (253)." This latter number refers to a missing specimen which Burchell considered identical with 285. Opposite (253) he had written "*Papilio* '88.' In open sunny places; very common about Ranchos and in yards near houses. It is often very familiar." [Butterflies of this genus (*Catagramma*) are called 88's because of the markings on the undersides of the hind wings.]

Westwood's list gives either one or two more of this date. The figure is indistinct.

4. 11. 25. = 766. Minas Geraës. (As 559.)

Westwood's list mentions three more captured on this date.

2. 3. 29. = 767. Porto Real (Nacional).

In the Godman-Salvin Collection the name *janeira* is given to the northern and eastern form; *clymena* (on the whole

rather more heavily marked on the underside and a deeper blue on the hind-wing upper surface) to the south-west; while four specimens from Rio Grande and Sta. Catherina (still further south), in which the blue at the apex of the fore wing is greatly reduced, are unnamed. Specimens of both *clymena* and *eluina* are grouped under N. 46 and also under N. 72 of Westwood's list. He gives the generic name *Catagramma* to both numbers.

Callicore eluina, Hew.

Bz. + 1. 8. 27. = **768**. The Brazilian label has the words "on the road," and upon the English label is "iter faciundo." Between Jundiahý and Cupivarý. North of S. Paulo. The 'Catalogus Geographicus' gives the date "a. 1. 8. 27" opposite the words "on road."

This date is not mentioned by Westwood.

25. 8. 27. 32 = **769-800**. Ollaría to Rio Pardo.

Bz. + 25. 8. 27. 7 = **801-807**. " "

Westwood's list gives nine more individuals captured on this date.

a. 26. 8. 27. 6 = **808-813**. Rio Pardo to Cubatáo. (As **734**.)

Bz. + a. 26. 8. 27. = **814**. " "

Westwood's list gives four more specimens of this date.

a. 28. 8. 27. = **815**. At Retiro. Just north of Rio Pardo.

This date, including the "a," is not mentioned by Westwood, but possibly one of his four additional specimens of the preceding date may have been accidentally copied as the 26th instead of the 28th.

28. 8. 27. 2 = **816, 817**. "Retiro." As above.

a. 29. 8. 27. 8 = **818-825**. Cérvó. (As **527**.)

Bz. a. 29. 8. 27. 3 = **826-828**. " "

Westwood's list gives six more specimens captured on this date.

a. 24. 8. 28. = **829**. Retiro. Between Goyaz and Jeraguá.

"All at the rivulet near the house at Retiro."

Bz. a. 24. 8. 28. = **830**. Retiro. Between Goyaz and Jeraguá. "All at the rivulet near the house at Retiro."

The dates of both **829** and **830** are omitted by Westwood.

Bz. 27. 8. 28 + 25. 8. 27. = **831**. Goiaveira (as **732**), or Ollaría to Rio Pardo.

This specimen evidently bears the labels of two specimens captured at dates a year apart. The Brazilian label bears the later date.

27. 8. 28. = **832**. Goiaveira. (As **732**.)

Westwood's list gives three individuals captured 27. 8. 27. As his list does not give any specimens dated 27. 8. 28 or

a. 24. 8. 28, it is possible that his 27. 8. 27 is a copyist's error for these omitted dates. One missing specimen of 25. 8. 27 may be represented by no. **831**.

Westwood's list also gives the following additional specimens which are now unfortunately missing:—

354. *I.* [15. 10. 25]. "*P[apilio]*. Minas Geraës. At the Discobérto do Antonio Velho."

12. 3. 26. Rio de Janeiro. "Aqueduct."

13. 3. 26. "

19. 3. 26. " "In the valley of Catombí."

3. 4. 26. " "Along the Carioca Aqueduct."

a. 29. 8. 27. Cérvó. (As **527**.)

30. 10. 27. 2 specimens. Sapezal to Conceição; near Goyaz.

28. 1. 28. Goyaz. Caminho de Ferréiro.

28. 4. 28. 10 specimens. Goyaz. "Papiliones caught by C[ongo] at the Carioca spring."

2. 2. 29. 2 specimens. Porto Real (Nacional), Western side of River. "On the western side of the Tucantins."

10. 3. 29. Porto Real. "Lepidoptera began to appear more numerous in the end of Feby, and since the beginning of this month they appear abundant."

24. 3. 29. Porto Real. Mánga.

12. a. 4. 5. 29. This specimen is almost certainly **764**.

The Godman-Salvin Collection contains only three specimens of this species. On **772** Westwood had written "*Cat. Eluina* Hew. Ex. B. f. 30."

Hæmaterá pyramus, F.

25. 8. 27. = **833**. Ollaría to Rio Pardo.

Westwood's name and date agree; the remaining two specimens come under the last number in his list of *Nymphalínæ*, and are not named by him.

27. 8. 27. = **834**. Rio Pardo to Retíro.

p. 8. 9. 27. = **835**. Cachoéira to Rio Grande. "At the Rio Grande. Papiliones."

Westwood's dates agree.

Eubagis (Dynamine) agacles, Dalm.

Bz. 581. *I.* [21. 10. 25]. = **836**. Minas Geraës. "*Pap[ilio]*. In a rossa at Discoberto, and along a channel (on the margin of the forest) which conducts water to the house."

10. 11. 25. = **837**. Minas Geraës.

Bz. 24. 3. 27. = **838**. "Pascuis prope sylvulis." On road W. beyond Praça da Alegria. Vicinity of S. Paulo.

Under this date in Westwood's list is written the word "Pascuis."

27. 4. 27. = 839. S. Paulo.

Bz. 27. 4. 27. = 840. S. Paulo.

9. 5. 27. = 841. Near the Convénio da Luz. S. Paulo.

26. 8. 27. = 842. R. Pardo to Cubatão. (As 731.) A label on this specimen bears Westwood's number "Nymph. 79," and the following note in his handwriting:—"Eub. cœnus, ♀ vel var."

24. 10. 27. = 843. Meiaponte to S. Joaquim (Joaq. Alves).

Bz. a. 24. 8. 28. = 844. Retiro. "All at the rivulet near the house at Retiro." Between Goyaz and Jeraguá.

20. 9. 29. = 845. Pará. S.E. of S. Jozé.

Westwood's list (N. 79) agrees.

Eubagis (Dynamine) cœnus, F.

4. 11. 25. 2 = 846, 847. Minas Geraës. (As 559.)

Bz. 11. 1. 27. = 848. Cubatão.

Bz. 1. 8. 27. = 849. "On the road." Between Jundiahy and Capivary.

Bz. + 25. 8. 27. 2 = 850, 851. Ollaria to Rio Pardo.

25. 8. 27. 2 = 852, 853. As above. A label on 852 bears Westwood's number N. 80, and the following note in his handwriting:—"Eub. Cœnus, Donovan. Ins. Ind."

a. 26. 8. 27. 2 = 854, 855. R. Pardo to Cubatão. (As 734.)

Westwood's list (N. 80) agrees.

Eubagis (Dynamine) athemon, Linn.

Bz. 361. I. [15. 10. 25.] = 856. Minas Geraës. "P[a-pilio]. At the Discoberto do Antonio Velho."

28. 10. 25. 2 = 857, 858. Minas Geraës. (As 635.) No. 858 bears Westwood's number "Nymph. 78."

Westwood's list (N. 78) agrees.

Eubagis (Dynamine) tithia, Hübn.

Bz. + 1004. I. 27. 10. 25. = 859. Minas Geraës. "P[a-pilio]. At San João de Nepomucena and on the road from Discoberto."

10. 11. 25. = 860. Minas Geraës.

Bz. + a. 26. 8. 27. = 861. R. Pardo to Cubatão. (As 734.)

30. 10. 27. = 862. Sapezal to Conceição. This specimen bears Westwood's number N. 83.

Westwood's list (N. 83) agrees.

Eubagis (Dynamine) glauce, Bates.

a. 24. 8. 28. ♂ = **863**. Retiro. "All at the rivulet near the house at Retiro." (As **844**.)

Westwood's list (N. 98) agrees, and the number, "Nym. 98," is also borne by **863**.

This specimen is unfortunately in very bad condition, thus rendering determination rather difficult. However, on comparing with specimens in the Godman-Salvin Collection and with Bates's description in the 'Journal of Entomology,' ii. p. 324, it seems nearly certain that the species is *E. glauce*.

Eubagis (Dynamine) mylitta, Cram., = *postverta*, Cram.

28. 10. 25. ♂ = **864**. Minas Geraës. (As **635**.)

24. 12. 25. ♂ = **865**. Rio de Janeiro. Aqueduct (on the first hill on the left). This specimen bears Westwood's number N. 84.

31. 12. 25. ♀ = **866**. Rio de Janeiro. (As **668**.)

10. 1. 26. 2, ♂ & ♀ = **867, 868**. Rio de Janeiro. Práia Grande and S. João de Carahý. **868** bears Westwood's number N. 82. (As **670**.)

Bz. 13. 3. 26. ♂ = **869**. "Aqueduct." Rio de Janeiro.

Bz. 15. 3. 26. ♀ = **870**. "Catombi." Rio de Janeiro. "Catombi, in plantis."

22. 3. 26. ♀ = **871**. Rio de Janeiro. Along the [Carioca] Aqueduct, to the head of the Valley of Laranjeiros.

Bz. 22. 3. 26. ♀ = **872**. Rio de Janeiro. (As **871**.)

Bz. 3. 4. 26. ♂ = **873**. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. 16. 3. 27. ♂ = **874**. Between Morumbi and S. Paulo.

No males in the above series have the black spot at the anal angle of the hind wing (upperside), which is a characteristic of most of the males in the Hope Collection, especially strongly marked in two from Chapada. In the British Museum also, the majority are without it; and in the Godman-Salvin Collection out of a large series only a small minority have it marked—noticeably in specimens from Chapada, Corumba, Peru, and Ecuador, where it is well defined. In one specimen from Paraguay it is very strongly marked.

Westwood's list (N. 82 and N. 84) adds three more individuals captured:—

12. 3. 26. Rio de Janeiro. "Aqueduct." (Under N. 84.)

1. 4. 26. Rio de Janeiro. "In the valley of Catumbi." (Under N. 82.)

9. 5. 27. S. Paulo. Near the Convénito da Luz. (Under N. 82.)

Eubagis (Dynamine) arene, Hübn.

7. 4. 29. ♀ = 875. Porto Real (Nacional).

26. 5. 29. ♂ = 876. "Silva." Between Itabóca and Baião. North of the Falls of Guaríba.

Westwood's list (N. 97) agrees, and both specimens bear this number.

This species is unrepresented in the British Museum.

Epicalia (Catonephile) acontius, Linn.

4. 12. 28. ♀ = 877. Porto Real. Walk to the Igarapé. "Papiliones, caught in the woody campo; but the long-wing[ed] one is only found in forests in the shade." As yet the identity of "the long-winged one" has not been established, but as the working out of the collection progresses no doubt this will become apparent.

This specimen bears Westwood's number (N. 32), and his date agrees: in his list Westwood wrote "*Epicalia Pierrettii*, ♀." *Epicalia pierrettii*, Dbl. & Hew., is an allied species.

Epicalia (Catonephile) penthia, Hew.

8. 2. 26. ♂ = 878. Organ Mtns. (In a ride to the Cattle Pounds and the Milho Roça.)

This specimen bears Westwood's number (N. 11).

- Bz. 13. 3. 26. ♀ = 879. Rio de Janeiro.

13. 3. 26. ♀ = 880.

Both these specimens bear Westwood's number (N. 10).

- a. 29. 8. 27. ♂ = 881. Cérvó. (As 527.)

Westwood's list (N. 10 and N. 11) agrees.

Nica flavilla, Godt.

- Bz. 189. I. [8. 9. 25]. = 882. Rio de Janeiro. "Papilio. Along the Aqueduct."

27. 1. 26. = 883. Rio de Janeiro.

- Bz. + 7. 3. 26. 2 = 884, 885. Rio de Janeiro. "At Catombí."

7. 3. 26. 2 = 886, 887. Rio de Janeiro. "At Catombí."

9. 3. 26. 2 = 888, 889. Rio de Janeiro. A label on 889 bears Westwood's number "Nym. 94," and the following note in his handwriting:—"Nica flavilla, Godt., 406, Hb. Samml., Ex. Sch."

- Bz. 9. 3. 26. = 890. Rio de Janeiro.

10. 3. 26. 3 = 891-893. „

Bz. 12. 3. 26. = 894. "Carioca Aqueduct." Rio de Janeiro.

Westwood's list reads 12. 3. 25, an obvious slip, because Burchell did not land at Rio till 18. 7. 25.

16. 3. 26. = 895. Rio de Janeiro. (As 647.)

21. 3. 26. = 896. "Along the Carioca Aqueduct."

26. 8. 27. = 897. R. Pardo to Cubatão. (As 731.)

This specimen bears the number N. 12*, and is mentioned under it in Westwood's list. It is the only specimen under that number.

21. 2. 28. = 898. Goyaz. W.N.W. beyond Forca. "All in woods."

Westwood's list (N. 94 and N. 12*) agrees.

Temenis laothoë, Cram., f. *ariadne*, Cram.

30. 10. 25. = 899. Minas Geraës. "(In the forest). On the N.E. side of the arraial of São João de Nêpomucéna."

This specimen bears Westwood's number N. 12.

4. 11. 25. = 900. Minas Geraës. (As 559.)

These two specimens are under a separate number (N. 12) in Westwood's list.

Bz. + 25. 8. 27. = 901. Ollaria to Rio Pardo.

a. 29. 8. 27. 2 = 902, 903. Cérvio. (As 527.)

1. 9. 27. = 904. "On the road." Veravinha to França [Villa Franca].

28. 10. 27. = 905. "In sylvia." S. Joaquim to Sapezál.

a. 24. 8. 28. = 906. Retiro. "All at the rivulet near the house at Retiro." Between Goyaz and Jeraguá.

This specimen bears Westwood's number "Nym. 93."

Bz. p. 24. 8. 28. = 907. Retiro. (As 514.)

p. 24. 8. 28. = 908. Retiro. (As 514.)

Instead of 906, 907, 908, Westwood's list (N. 93 except for 899, 900 mentioned above) gives two specimens dated a. 24. 8. 27 and p. 24. 8. 27 (the first probably mistaken for 906, and the second for either 907 or 908).

In the British Museum this insect is placed as the *ariadne* form of *laothoë*; in the Godman-Salvin collection as the *laothoë* form of *ariadne*. *Laothoë* and *ariadne* were both described by Cramer in the same work, but inasmuch as *ariadne* appears on the later page, it would seem that *laothoë* should stand.

Epiphile oreá, Hübn.

9. 2. 26. = 909. Organ Mtns. (By the river Pacaqué.)

Bz. p. 24. 8. 28. = **910**. Retiro. (As **514**.)

Westwood's list (N. 9) agrees, and this number is borne by both specimens.

Libythina cuvierii, Godt.

10. 10. 27. = **911**. Bomfim to Forquílho.

Westwood's list (N. 100) agrees, and his number is on this specimen. Burchell's example is a good deal smaller than any in the British Museum series.

Myscelia orsis, Drury.

Bz. + 8. 11. 25. ♂ = **912**. "Sylvatica" on the English label, "Pap^s. sylvat." on Brazilian label. Minas Geraës.

10. 11. 25. ♀ = **913**. Minas Geraës.

12. 3. 26. 3 ♂ = **914, 915, 916**. Rio de Janeiro. "Aqueduct."

Westwood's list gives two more of this date (under N. 14).
Bz. 1056. [17. 3. 26]. ♀ = **917**. Rio de Janeiro. "Along the Carioca aqueduct, and descending the high hill (mentioned 31. 1. 26) into the valley of Catombi.—But they were mostly along the Aqueduct; and only a few on the hill."

A further note on this date says:—"Papiliones. These 3 species frequent the woods." [The Satyrine butterfly *Euptychia ocirrhoe*, F., referred to on p. 57, and the Nymphaline *Myscelia orsis*, Drury.] As yet it has been impossible to find out the third species here mentioned.

17. 3. 26. 3 ♂ 1 ♀ (**920**) = **918-921**. Rio de Janeiro.
(As above.)

Westwood's list gives altogether two specimens numbered 1056 (under N. 13 and N. 14), four with 17. 3. 26 under N. 14 and one under N. 13. **919** and **921** bear Westwood's number N. 14.

18. 3. 26. ♀ = **922**. Rio de Janeiro. "Along the Carióca Aqueduct."

20. 3. 26. ♀ = **923**. Rio de Janeiro. "Along the Carioca Aqueduct."

This specimen bears Westwood's number N. 13.

Westwood's list gives another specimen captured on this and the previous date. His list contains a specimen of each date under N. 13 and a similarly dated pair under N. 14.

21. 3. 26. ♀ = **924**. Rio de Janeiro. "Along the Carioca Aqueduct."

3. 4. 26. ♀ = **925**. "Along the Carioca Aqueduct."

Westwood's list gives three altogether of this date, two under N. 14 and one under N. 13.

20. 9. 26. ♀ = **926**. "Sylva." Santos. "In the forest above the Monastery of S. Bento."

26. 9. 26. ♀ = **927**. Santos. In a walk to the Chapel on Montserrat. "These Papiliones very plentiful in the woods."

Westwood's list (N. 13) includes a date, 29. 9. 26, which is probably an erroneous copy of 26. 9. 26, otherwise unaccounted for. Except for the above additions his list (N. 13 and N. 14) agrees.

Eunica bechina, Hew.

4. 12. 28. = **928**. Porto Real (Nacional). Walk to the Igarapé. "Papiliones, caught in the woody campo; but the long-wing[ed] one is only found in forests in the shade." See note on **877**.

Bz. + 28. 3. 29. ♀ = **929**. Porto Real. This specimen bears Westwood's number N. 15*.

Westwood's list (N. 15*) agrees.

Eunica maia, F.

Bz. 558. II. [19. 10. 25]. ♂ = **930**. Minas Geraës. "*Papilio*."

Westwood's list gives another of this date.

Bz. + 896. V. 25. 10. 25. 4 ♂ = **931-934**. Minas Geraës. "*Papilio*. At Discoberto, near João Pedro's house."

896. 25. 10. 25. ♂ = **935**. Minas Geraës. One of the above without the Brazilian label.

This specimen bears Westwood's number N. 15**.

29. 10. 25. ♂ = **936**. Minas Geraës. "In the forest on the S.E. side of S. João de Nepomucéna."

4. 11. 25. ♂ = **937**. Minas Geraës. (As **559**.)

Westwood's list (N. 15**) adds another specimen captured 10. 10. 27. Bomfim to Forquilha. He also includes the next species. His dates agree.

Eunica mygdonia, Godt.

10. 4. 28. ♂ = **938**. Goyaz. Caminho de Carreira. (As **733**.)

Westwood's date agrees.

Eunica taurione, Hübn.

7. 11. 25. = **939**. Minas Geraës.

Westwood's list (N. 15) agrees, and his number is borne by this specimen.

Eunica volumna, Godt., = *tithonia*, Feld.

10. 10. 27. = **940**. Bomfim to Forquílho.

Westwood's list (N. 99) agrees, and his number is on this specimen.

Eunica caresa, Hew.

4. 11. 25. = **941**. Minas Geraës. (As **559**.) Westwood's number (N. 31) is borne by this specimen.

Westwood's date (under N. 31) agrees, but he gives the name "*Myselfia sydonia*." A label on the specimen bears in Westwood's handwriting:—"Mys. Sydonia, Godt., 416?"

Eunica margarita, Godt.

20. 6. 27. = **942**. "Rita." Vicinity of S. Paulo. Westwood's number "Nym. 96" is on this specimen.

Westwood's list (N. 96) gives two specimens captured on this date.

Anartia amalthea, Linn.

Bz. 349. III. [15. 10. 25]. 2 = **943, 944**. Minas Geraës. "*P[apilio]*. (Visa quoque ad Rio de Janeiro.) At the Discobérto do Antonio Velho."

Westwood adds another of this date.

Bz. + 895. III. 25. 10. 25. 3 = **945, 946, 947**. Minas Geraës. "*Papilio*. At Discoberto, near João Pedro's house."

14. 1. 26. 3 = **948, 949, 950**. Rio de Janeiro. (As **698**.)

27. 1. 26. = **951**. Rio de Janeiro.

31. 1. 26. 2 = **952, 953**. Rio de Janeiro. (As **474**.)

9. 2. 26. = **954**. Organ Mtns. (By the river Pacaqué.)

12. 2. 26. = **955**. Organ Mtns.

Bz. + a. 25. 2. 26. = **956**. "Frexaes." Organ Mtns. Burchell sometimes wrote "Frexaes" for "Frechál."

a. 25. 2. 26. = **957**. "Frexaes." Organ Mtns. See note on **956**.

Bz. + 26. 2. 26. = **958**. Organ Mountains. Near Magé.

28. 2. 26. = **959**. Organ Mountains. On the Rio Magé.

Westwood's list adds another of this date.

1. 3. 26. = **960**. Organ Mtns. Along the River Magé, upwards to the Fazénda da Lagóa. Westwood's list adds three more individuals captured on this date.

Bz. + 2. 3. 26. = **961**. Rio de Janeiro or Organ Mtns.

Westwood's list gives another of this date.

7. 3. 26. 2 = **962, 963**. Rio de Janeiro. "At Catombí."

10. 3. 26. = **964**. Rio de Janeiro.

16. 3. 26. ♂ = **965**. Rio de Janeiro. (As **647**.)

This specimen bears Westwood's number (N. 1).

16. 3. 26. **966**. Rio de Janeiro.

Bz. 15. 9. 26. = **967**. Santos. "Papil. at edge of the forest at S. Bento Monastery."

19. 9. 26. = **968**. Santos.

Westwood's list gives two more individuals captured on this date.

a. 29. 8. 27. = **969**. Cérvó. (As **527**.)

9. 1. 28. 3 = **970, 971, 972**. Goyaz. By the Horta etc.

4. 3. 28. 5 = **973-977**. Goyaz. "Caught by the rio Vermelho, near the Carioca aqueduct: by C[ongo]."

Bz. 2. 2. 29. = **978**. Porto Real. "On the western side of the Tucantins."

19. 2. 29. = **979**. Porto Real.

18. 12. 29. = **980**. "in locis apertis." Pará. Rivulet above arsenal.

Form *amalthea*, L., in British Museum.

With the exception of **980**, all the above specimens are form named *roscelia*, Esch., in British Museum. The form *amalthea* seems to be more prevalent in Trinidad, Honduras, Guiana, and Bolivia. In Colombia an intermediate form exists. The difference between them is that the subapical white bar of the fore wing of f. *roscelia* is replaced in f. *amalthea* by faint and indistinct white spots.

Westwood's list (N. 1) omits **969**, and adds two specimens captured respectively, 8. 2. 26, Organ Mtns., and 5. 2. 29, Porto Real. The dates otherwise agree.

No date. = **981**. Placed by Westwood in his list of *Anartia jatrophe*, Linn. Considering the obvious differences between these two species, it is, perhaps, probable that Burchell's label has become displaced from this specimen on to the dateless *jatrophe* mentioned by Westwood. There is now no *A. jatrophe* without a date in the collection, and there is no *A. amalthea* mentioned in Westwood's list without a date.

Anartia jatrophe, Linn.

10. 1. 26. 3 = **982, 983, 984**. Rio de Janeiro. (As **670**.)
 14. 1. 26. = **985**. Rio de Janeiro. (As **698**.)
 26. 1. 26. = **986**. " Morro de Ladéira and Catombý. (As **672**.)
Bz. + 27. 1. 26. = **987**. Rio de Janeiro.
 31. 1. 26. = **988**. (As **474**.)
 26. 2. 26. 2 = **989, 990**. Organ Mtns. Near Magé.
 Westwood's list gives another of this date.
 1. 3. 26. = **991**. (As **960**.)
 9. 3. 26. = **992**. Rio de Janeiro.
 19. 3. 26. = **993**. " " "In the valley of Catombý."
Bz. 27. 3. 26. = **994**. Rio de Janeiro. From the Village of São Domingos to the island of Boa Viagem. "On the main-land about Fort Boa Viagem."
 27. 3. 26. 3 = **995, 996, 997**. (As **994**.)
 Westwood's list gives another specimen captured on this date. On **995** his label gives both catalogue numbers (N. 5 and 54) and the name "*Anartia Jatrophæ*, Linn."
 14. 4. 27. = **998**. Near S. Paulo. In the Campo beyond Bóá Mórte.
 26. 4. 27. 15 = **999-1013**. Vicinity of S. Paulo.
1001 bears Westwood's label N. 5.
Bz. 26. 4. 27. 2 = **1014, 1015**. Vicinity of S. Paulo.
 Westwood's list adds three more specimens of this date.
 6. 5. 27. = **1016**. Vicinity of S. Paulo.
 20. 6. 27. = **1017**. "Rita." Vicinity of S. Paulo.
 20. 6. 27. = **1018**. Vicinity of S. Paulo.
Bz. 20. 6. 27. = **1019**. Vicinity of S. Paulo.
 Westwood's list gives two more specimens captured on this date.
 23. 6. 27. = **1020**. "Rita." Vicinity of S. Paulo.
 9. 1. 28. = **1021**. Goyaz. By the Horta, etc.
 18. 1. 28. = **1022**. Goyaz. Rio Manoel Mines, etc.
 23. 1. 28. = **1023**. Goyaz.
 30. 4. 28. = **1024**. Goyaz.
Bz. + 29. 1. 29. = **1025**. Porto Real (Nacional). "Caught on the bank of the Tucantins, while measuring the base line."
Bz. + 19. 5. 29. = **1026**. Araguáy. [S. João da Araguay.]
Bz. + 7. 6. 29. = **1027**. Sta. Anna. Rio Tocantins, between Baião and Pará.

1386. 26. 6. 29. 2 = 1028, 1029. Pará, "near my house (Pombo roçinha)."

Bz. + 1386. 26. 6. 29. = 1030. Pará, "near my house (Pombo roçinha)."

Bz. + 17. 7. 29. = 1031. Pará.

23. 7. 29. = 1032. Pará, "between my house and the City."

21. 9. 29. = 1033. Pará.

Westwood's list adds three individuals captured 10. 2. 27, 24. 4. 27, 7. 6. 27, near S. Paulo; and one, 4. 3. 28, Goyaz. "Caught by the rio Vermelho, near the Carioca aqueduct; by C[ongo]."

Westwood had put this species under two numbers (N. 5 and N. 34), and against these he wrote the name *Anartia jatrophe*, and against N. 34 the additional note "Same as N. 5."

Junonia (Precis) hübneri, Kirb.

Bz. 145. I. [16. 8. 25]. = 1034. Rio de Janeiro. "*Papilio* [ilic]. Above the Teresa Convent; and on the woody hilly [hills] along the Aqueduct." Dry-season form.

7. 11. 25. = 1035. Minas Geraës. Dry season.

10. 11. 25. 2 = 1036, 1037. Minas Geraës. 1036 is dry side of intermediate; 1037 is much worn, but probably intermediate.

24. 12. 25. = 1038. Rio de Janeiro. Aqueduct (on the first hill on the left). Dry season. Slightly inclined to intermediate.

Bz. + 1. 3. 26. 2 = 1039, 1040. Organ Mtns. (As 960.) 1039 is intermediate side of dry; 1040 is a typical dry-season form.

1. 3. 26. = 1041. (As 960.) Intermediate side of dry.

Bz. 15. 3. 26. = 1042. Rio de Janeiro. "Catombi, in plantis." Intermediate.

17. 3. 26. = 1043. Rio de Janeiro. (As 917.) Intermediate side of wet.

Bz. 20. 3. 26. = 1044. Rio de Janeiro. "Along the Carioca Aqueduct." Wet season.

27. 3. 26. = 1045. Rio de Janeiro. (As 994.) Wet season.

4. 3. 27. = 1046. Morumbý. E^a. of the house. Wet season.

9. 1. 28. = 1047. Goyaz. By the Horta, etc. Intermediate.

18. 1. 28. = 1048. Goyaz. Rio Manoel Mines, etc. Intermediate, inclined to dry.

4. 3. 28. = **1049**. Goyaz. "Caught by the rio Vermelho, near the Carioca Aqueduct, by C[ongo]." Wet season.
3. 4. 28. = **1050**. Goyaz. Caminho de Bacopary. Intermediate.
10. 4. 28. = **1051**. Goyaz. Caminho de Carréira. (As **733**.) Intermediate, inclined to wet.
- Bz. 4. 9. 28. = **1052**. "Very common in the Campos." Estiva to Fazenda seca. "Papiliones, at a rivulet on the road." Typical dry season.
8. 11. 28. = **1053**. Canga. Corrego Raiz. "At Corrego Raiz, drinking on the moist sand in the road where it crosses the rivulet." Intermediate.
- Westwood's list gives two specimens captured 8. 11. 28.
- Bz. 28. 11. 28. = **1054**. Porto Real (Nacional). Wet side of intermediate.
28. 11. 28. = **1055**. Porto Real. Intermediate.
- Bz. + 1265. 1. 12. 28. = **1056**. Porto Real. "*Papilio*. This merits most decidedly the name of *campestris*, as it is very common in all the Campo beyond and on this side of Goyaz, but I have always found it difficult to catch them which accounts for my collection possessing so few of so common a butterfly." Wet season.
- Burchell's ideas of an adequate series may be inferred from the fact that his collection contained twenty-six specimens (including three in Westwood's list and now missing) at the date when he spoke of the numbers as "so few."
- Bz. 30. 12. 28. = **1057**. Porto Real. Dry, inclined to intermediate.
- Bz. 2. 2. 29. = **1058**. Porto Real. "On the western side of the Tucantins." Dry season.
1316. 17. 2. 29. 2 = **1059, 1060**. Porto Real. "Feeding on the flowers of the Waltheria bushes" (v. H. 8632 x). See note on **663** on p. 93. Worn, but probably dry.
17. 2. 29. = **1061**. Porto Real. Dry to intermediate.
11. 3. 29. = **1062**. Porto Real. Dry to intermediate. This and the above are very worn.
- Bz. + 28. 3. 29. = **1063**. Porto Real. Wet season.
18. 12. 29. = **1064**. "in locis apertis." Pará. Rivulet above Arsenal. Dry side of intermediate.

This specimen bears Westwood's number (N. 2) ; his list adds four more individuals, captured 31. 1. 26, Rio de Janeiro (as **474**) ; 7. 3. 26, Rio de Janeiro, "At Catombí" ; 21. 9. 27, between Lanboso and Bomfim ; and 20. 8. 29, Pará.

Pyrameis myrinna, Doubl.

Bz. + p. 25. 2. 26. = **1065**. Organ Mtns. Between Frechal and Magé.

18. 10. 26. = **1066**. Santos. In a walk from the Outeirinhos to the town.

Westwood's list (N. 3) makes this last date 28. 10. 26, probably a clerical error. He also places these two specimens in his list of the next species under the name of "*Vanessa huntera*." These Burchell specimens have been compared with the types of *P. myrinna*, Doubl., in the British Museum.

Pyrameis huntera, Fabr., form *brasiliensis*, Moore.

10. 11. 25. = **1067**. Minas Geraës.

6. 12. 25. = **1068**. Rio de Janeiro. On the Corcovado Mountain. (As **667**.)

This specimen bears Westwood's number N. 3.

7. 6. 27. = **1069**. Vicinity of S. Paulo.

Westwood's list (N. 3) gives two more specimens, one captured 4. 11. 25, Minas Geraës (as **559**), and one 20. 6. 27, S. Paulo. He names it *Vanessa huntera*.

Mr. F. A. Heron, of the British Museum, kindly informs me that *brasiliensis* is the name given to the southern form of *huntera*, and he mentions the following chief points of difference:—in *huntera* there is no white in the cell of the fore wing, while in *brasiliensis* there is usually a white patch on the discocellulars; again, in the hind wing of *huntera* the eye-spots are usually confluent to form a postdiscal band, while in *brasiliensis* the eye-spots are well separated, and in some cases reduced to mere points. In the latter form also there is always a strongly marked discal band in both sexes, which is hardly ever found in *huntera* males, and never in the females.

Eurema (Hypanartia) lethe, Fabr.

9. 2. 26. 2 = **1070, 1071**. Organ Mtns. (By the River Pacaqué.)

a. 26. 8. 27. = **1072**. R. Pardo to Cubatão. (As **734**.)

This specimen bears Westwood's number N. 4*.

Bz. + a. 28. 8. 27. = **1073**. "At Retiro." Just N. of R. Pardo.

Westwood's list (N. 4*) adds another specimen, captured a. 29. 8. 27, at Cérvó. (As **527**.) Against this and the next species Westwood had written in his list the generic name "*Eurema*."

Eurema (Hypanartia) bella, Fabr.

4. 11. 25. = **1074**. Minas Geraës. (As **559**.)

Bz. 9. 3. 26. = **1075**. Rio de Janeiro.

This specimen bears Westwood's number N. 4; his list adds another, captured 26. 11. 26 at Santos.

These two species, originally placed under one number (N. 4) in a clerk's handwriting, were differentiated by Westwood, who placed the examples of *lethe* under a new number (N. 4*).

Phyciodes hera, Cram., = *ithra*, Kirby.

28. 10. 25. = **1076**. Minas Geraës. (As **635**.)

30. 10. 25. = **1077**. " " (In the forest). On the N.E. side of the arraial of São João de Nêpomucéna."

Bz. + 6. 11. 25. = **1078**. "At Capitão Leite's." Minas Geraës.

6. 11. 25. 3 = **1079, 1080, 1081**. Minas Geraës. "At Capitão Leite's."

Westwood's list only mentions two specimens of this date besides **1078**.

Nos. **1080** and **1081** are unfortunately in a very bad state of preservation, the former being represented by a fore wing and hind wing, while only the hind wing of the latter now remains.

10. 11. 25. 2 = **1082, 1083**. Minas Geraës.

10. 4. 27. = **1084**. Near S. Paulo. A note dated 9. 4. 27 says that "These and the insects about this date were killed in cachaça and a little corrosive sublimate."

25. 8. 27. 2 = **1085, 1086**. Ollaria to Rio Pardo.

1086 bears Westwood's number N. 81.

Bz. + p. 26. 8. 27. = **1087**. R. Pardo to Cubatão. (As **735**.)

27. 8. 27. 3 = **1088-1090**. R. Pardo to Retiro.

Bz. + 27. 8. 27. = **1091**. " "

Westwood's list adds another specimen captured on this date.

24. 10. 27. = **1092**. Meiaponte to S. Joaquim (Joaq. Alves).

30. 10. 27. = **1093**. Sapezal to Conceição.

5. 3. 28. = **1094**. Goyaz. "Caught by the rio Vermelho, near the Carioca Aqueduct; by C[ongo]."

Bz. a. 24. 8. 28. = **1095**. Retiro. "All at the rivulet near the house at Retiro."

Westwood's list (N. 81) gives an individual captured a. 24. 8. 27, which is probably a copyist's mistake for the date of **1095**. He also mentions "one without a number."

Phyciodes teletusa, Godt.

904. I. 25. 10. 25. ♀ = **1096**. Minas Geraës. "*P[apilio]*. At Discoberto, near João Pedro's house."

This specimen bears Westwood's number N. 87.

28. 10. 25. ♀ = **1097**. Minas Geraës. (As **635**.)

4. 11. 25. ♀ = **1098**. Minas Geraës. (As **559**.)

9. 3. 26. ♂ = **1099**. Rio de Janeiro. This specimen bears Westwood's number "Nym. 89," and is the only one under this number.

Westwood's list (N. 87 and N. 89) agrees.

Phyciodes sejona, Schaus.

6. 8. 27. = **1100**. "Campinas." Between Mogy Mirim and S. Paulo.

This specimen bears Westwood's number "*Eryc.*^{da} 70," and is given in his list of *Erycinidæ*. Unfortunately it is in a very bad state of preservation, so that its determination cannot be quite certain. However, there are traces of certain markings on the underside which have led to its inclusion in this series.

28. 10. 27. 2 = **1101, 1102**. S. Joaquim to Sapezál.

30. 10. 27. 3 = **1103, 1104, 1105**. Sapezál to Conceição.

Bz. 30. 10. 27. = **1106**. Sapezál to Conceição.

25. 8. 28. = **1107**. Retiro to Goyavéira. "On the road." This specimen bears Westwood's number "Nym. 91"; his list agrees.

Professor E. B. Poulton, F.R.S., and Mr. R. Trimen, F.R.S., have very kindly examined these specimens, and agree that they conform to Schaus's description of *P. sejona*. Unfortunately the type is in America, so that comparison has been impossible. The species is remarkably near *P. teletusa*, and, in fact, may turn out eventually to be only a more northern form of it. The whole genus is composed of such variable species that it is most desirable that breeding should be undertaken on a large scale to establish each species on a satisfactory basis.

Phyciodes burchelli, sp. n.

- Bz. 24. 10. 27. = **1108**. Meiaponte to S. Joaquim (Joaq. Alves). The type of the species.
 28. 10. 27. = **1109**. S. Joaquim to Sapezál.
 30. 10. 27. = **1110**. Sapezál to Conceição. This specimen bears Westwood's number N. 90.
 25. 8. 28. 3 = **1111, 1112, 1113**. Retiro to Goyavéira. "On the road."

Westwood's list (N. 90) agrees.

This species is unnamed in the British Museum, where it is placed next to *P. teletusa*; the Godman-Salvin Collection contains a long series also unnamed from Chapada and South Brazil, and a few specimens exist in the collection of Mr. H. Grose-Smith.

(1108.) *Upperside*. Ground-colour dark fuscous-brown; a wide orange-tawny band from inner margin of hind wing to near costa of fore wing, broken at apex. *Fore wing*: from inner margin an orange-tawny band, the breadth of which is a little less than half the length of the inner margin, to a little above the third median nervule, leaving externally a narrow hind-marginal border of ground-colour, in middle of which are three orange-tawny lunular markings situated respectively between the submedian nervure and the first median nervule, between the first and second median nervules, and just above the third median nervule. The orange-tawny band is broken off about the third median nervule by a narrow streak of ground-colour running obliquely from costa to centre of hind margin and widest at costal end, leaving an apical marking of orange-tawny which runs from the subcostal nervure to the second median nervule; it is widest in centre and is roughly triangular in shape. A faint orange spot at exterior end of cell. Cilia of the ground-colour. *Hind wing*: orange-tawny band of fore wing continued across hind wing, superiorly slightly broader and occupying a good half of the hind wing, and extending to inner margin, leaving a little wider hind-marginal border of ground-colour than in the fore wing. Exterior edge of orange band is marked by a row of faint ground-colour lunular markings which merge into the hind-marginal border at second subcostal nervule; hind-marginal border itself traversed by a series of linear orange-tawny lunules, one in each internervular space, the largest being above the first subcostal nervule. Cilia as in fore wing. Hind margin crenelated.

Underside. Light tawny ground-colour very much paler in hind wing, with brown subapical and hind-marginal markings. *Fore wing:* tawny ground-colour slightly darker towards middle and end of cell, a little beyond which is a dark brown oblique bar from end of first subcostal nervule to hind margin at end of second median nervule; outer edge of bar straight, inner edge concave, the hind-marginal end broadening out over anal angle. External to this bar a light fulvous one, almost broken in middle, the outer edge of which is irregularly defined, and wider towards hind margin. This is succeeded by a lilac-brown apical patch, with a short oblique narrow whitish mark on the costa. A narrow lunulated brown-fulvous edging to hind margin. Central portion dull orange-fulvous, corresponding to orange-tawny band of upperside. The apical markings are variable. *Hind wing:* basal part appears slightly darker through presence of very delicate and irregular light brown transverse lines. A hind-marginal band of lilac-brown, growing lighter towards each extremity about first subcostal nervule and about first discoidal nervule. In this band a connected series of whitish lunules from costa to anal angle; on inner edge of band five small dark brown inwardly pale-margined spots, of which the two middle (between the radial and second median nervule) are largest.

Exp. al. 31-36 mm. (type 33 mm.).

Type, specimen 1108 in Hope Department, University Museum, Oxford.

Distribution (based on six specimens taken by Burchell and on a series in Godman-Salvin Collection). Rio Tocantins, province of Goyaz; Chapada and South Brazil. In the British Museum there are five specimens (1 ♂ from Nauta, Upper Amazons, Peru, 3 ♂ 1 ♀ from Ecuador) which are very near it, if not actually the same species.

Compared with *P. cluvia*, G. & S. (Biol. Centr.-Amer., Rhopal. pl. xxi. figs. 21, 22), on the upperside *burchelli* bears a close resemblance to it, but the tawny lunular line in the hind margin of the hind wing in *burchelli* is wanting in *cluvia*, and the hind-marginal band of fuscous brown in *cluvia* does not reach the anal angle as in *burchelli*. The undersides are remarkably different: *cluvia* has a unicolorous tawny brown hind wing, and the fore wing is of the same colour except for two orange-tawny patches.

P. teletusa, on the other hand, is nearly related to *burchelli* on the underside as well as the upper.

Phyciodes claudina, Esch.

10. 1. 26. = **1114**. Rio de Janeiro. (As **670**.)
 31. 1. 26. = **1115**. " (As **474**.)
 1. 3. 26. = **1116**. " (As **960**.)
 7. 3. 26. 2 = **1117, 1118**. Rio de Janeiro. "At Catombí,"
Bz. + 7. 3. 26. = **1119**. " "
 10. 3. 26. 2 = **1120, 1121**. " "
 13. 3. 26. = **1122**. " "
 20. 3. 26. 2 = **1123, 1124**. Rio de Janeiro. "Along the
 Carioca Aqueduct."
1123 bears Westwood's number "Nymph. 85."
Bz. 20. 3. 26. = **1125**. Rio de Janeiro. "Along the
 Carioca Aqueduct."
 3. 4. 26. = **1126**. Rio de Janeiro. "Along the Carioca
 Aqueduct."

Westwood's list (N. 85 and N. 86) agrees. He placed this species and the succeeding two all together under these two numbers.

Phyciodes liriöpe, Cram.

- Bz.* 313. I. [14. 10. 25.] = **1127**. Minas Geraës. "*Pa-*
pilio." Parahíba (on Oct. 12).
Bz. 345. II. [15. 10. 25.] 2 = **1128, 1129**. "*P[apilio]*. At
 the Discoberto do Antonio Velho."
Bz. + 918. II. 25. 10. 25. 2 = **1130, 1131**. Minas Geraës.
 "*P[apilio]*. At Discoberto, near João Pedro's house."
Bz. + 1005. I. 27. 10. 25. = **1132**. Minas Geraës. "*P[a-*
pilio]. At San João de Nepomucéna and on the road
 from Discoberto."
Bz. 12. 3. 26. = **1133**. Rio de Janeiro. "Aqueduct."
 28. 10. 27. 3 = **1134, 1135, 1136**. S. Joaquim to Sapezál.
 30. 10. 27. 4 = **1137-1140**. Sapezál to Conceição.
Bz. + 30. 10. 27. = **1141**.
 a. 24. 8. 28. = **1142**. Retiro. "All at the rivulet near the
 house at Retiro." (As **844**.)
 This specimen bears Westwood's number "Nym. 86."
Bz. + 26. 5. 29. = **1143**. "Silva." Between Itabóca and
 Baião; north of the Falls of Guaríba.
 p. 31. 5. 29. = **1144**. Baião.
 p. 31. 5. 39. = **1145**. "Sylva." This date must be a slip
 for 31. 5. 29. Baião.

It is, perhaps, worthy of note that "39" for "29" is the only mistake of the kind so far detected among some 1200

specimens labelled by Burchell. A second will be found on 1221.

20. 9. 29. 2 = 1146, 1147. Pará. S.E. of S. Jozé.

Westwood's list (N. 85 and N. 86) agrees.

Phyciodes fragilis, Bates.

a. 24. S. 28. = 1148. At Retiro. "All at the rivulet near the house at Retiro." (As 844.)

Westwood's list (N. 86) agrees, though he placed the specimen in his list of the preceding species.

Phyciodes pedrona, sp. n.

920. I. 25. 10. 25. = 1149. Minas Geraës. "*P[apilio]*."

At Discoberto, near João Pedro's house."

The type of the species.

The specimen bears Westwood's number (N. 95); his list agrees.

A single specimen exists, unnamed and without any data, in the B. M. collection.

(1149.) *Upperside*. Dark fuscous-brown ground-colour relieved with tawny-yellow spots, an irregular line of which crosses the hind wing from costa to inner margin. *Fore wing*: from costa to inner margin a broken line of six tawny-yellow spots; the first is situated on the costa about the end of the second subcostal nervule, the next two between upper radial and third median nervule; the remaining three continue the line 1 millimetre nearer the base, one spot below each median nervule, the middle one being slightly the largest: this line is succeeded externally by a similarly irregular line of five smaller spots; the first is very faint and is placed between the first and second radial nervules. Close to hind margin between third and second median nervules a tawny yellow spot. Basal portion relieved by smaller orange-tawny spots. Cilia of ground-colour. *Hind wing*: from centre of costa to a point two-thirds the length of inner margin a concave line of seven internervular tawny-yellow spots. Halfway between this and hind margin a similar row of six small dark brown inwardly tawny-margined spots—no spot on costa in this series. Not far from hind margin a row of seven almost linear tawny-yellow lunules. A few small orange-tawny spots in basal region. Cilia as in fore wing.

Underside. Bright tawny-yellow ground-colour, marked by dark brown patch between median nervules in fore wing. *Fore wing:* from a point on costa between first and second subcostal nervules to third median nervule a narrow pale ochreous macular stripe, continued to inner margin 1 millimetre nearer to base, broadening at inner margin towards anal angle. This stripe is succeeded by a large apical patch of slightly richer tawny yellow. Below this and between median nervules a dark fuscous-brown patch prolonged upwards by two similarly coloured spots between radial nervules, and downwards by a small spot below first median nervule. A line of three pale ochreous spots parallel to hind margin from below second radial nervule to below second median nervule; the middle one occupies centre of fuscous-brown patch. External to patch and bordering on hind margin between third and second median nervules a large pale ochreous spot. A faint hind-marginal border of dark tawny lunules. *Hind wing:* basal region pale ochreous, with irregular broken sub-basal and median indistinct yellow macular streaks. Exterior region tawny yellow, relieved by a line of small dark fulvous inwardly yellow-margined internervular spots from apex to anal angle. Hind marginal row of fulvous inwardly yellow-margined lunules. Cilia of slightly lighter ground-colour than on upperside.

Exp. al. 25 mm.

Type, specimen 1149 in Hope Department, University Museum, Oxford.

Distribution (based on this single specimen). The southern part of Minas Geraës, near Rio.

The upper surface of *P. pedrona* is near to that of *P. tharos*, Drury. Compared with a single specimen in the Hope Collection from Mexico, *tharos* is 5 mm. larger in expanse of wings; the spots of the hind wing are larger, and two large spots appear in the basal region which are unrepresented in *pedrona*. The fore wing of *tharos* differs considerably in having a well-marked and regular submarginal row of six spots, while *pedrona* has a faint and irregular series of five; *tharos*, again, has a pale oblique streak beyond cell and another broken pale oblique streak from cell to inner margin, both of which are absent in *pedrona*. There are also more fulvous markings at base in *tharos*. On the underside of fore wing three fuscous-brown markings appear in *tharos*, one along the outer edge of cell, another just above anal angle, and a third in centre of inner margin, in contrast to the single submedian fuscous-brown

marking in *pedrona*. The two species are, on the whole, very markedly different.

In the British Museum a single specimen of *pedrona* is placed next to *P. simois*, Hew. (Pernambuco and "Brazil"). In *simois* a larger black marking is apparent behind the lower part of the hind margin; but rows of white spots take the place of the pale yellow spots in *pedrona*, and in the fore wing of *simois* there are white and rufous spots at the apex and outer margin which are absent in *pedrona*.

Eresia eunice, Hew.

16. 6. 29. = 1150. Pará.

29. 7. 29. = 1151. Pará.

Specimen 1151 bears Westwood's number A. 5 and "*Eresia Esora*"; his dates agree, but he gives this species the name of *Eresia esora* and places it among his list of *Acræinæ*.

Eresia langsdorffii, Godt.

28. 10. 25. = 1152. Minas Geraës. (As 635.)

This specimen bears Westwood's number A. 6, and "*Eresia Langsdorffii*."

29. 10. 25. = 1153. Minas Geraës. "In the forest on the S.E. side of S. João de Nêpomucéna."

4. 11. 25. = 1154. Minas Geraës. (As 559.)

This specimen bears Westwood's number A. 6.

10. 11. 25. = 1155. Minas Geraës.

6. 12. 25. = 1156. Rio de Janeiro. On the Corcovado Mountain. (As 667.)

8. 2. 26. = 1157. Organ Mountains. (In a ride to the Cattle Pounds and the Milho Roça.)

1. 12. 26. = 1158. Santos.

Westwood's list omits 1155 and 1156, but otherwise agrees both in dates and names, although this species is also placed, as A. 6, among the *Acræinæ*.

Eresia perna, Hew.

28. 10. 25. ♂ = 1159. Minas Geraës. (As 635.)

This specimen bears Westwood's number A. 7, and "*Perna*."

29. 10. 25. = 1160. Minas Geraës. In the forest on the S.E. side of S. João de Nêpomucéna.

Westwood's dates and names agree. This also appears, as A. 7, in his list of *Acraëna*.

Eresia clara, Bates.

18. 12. 29. = **1161**. "Silvatica." Pará. Rivulet above Arsenal.

This specimen bears Westwood's number (N. 88), and his list agrees.

Euptoieta hegesia, Cram.

26. 1. 26. 3 = **1162, 1163, 1164**. Rio de Janeiro. Morro de Ladéira and Catombý. (As **672**.)

28. 3. 29. = **1165**. Porto Real (Nacional).

Bz. + 2 p. 28. 5. 29. 3 = **1166, 1167, 1168**. A Campo Bank; between Itabóca and Baião.

2 p. 28. 5. 29. = **1169**. A Campo Bank; between Itabóca and Baião.

Westwood's list (N. 63) gives one more specimen of this last date, but otherwise agrees. He named it "*Atella Hegesia*." As none of the above specimens bear Westwood's number, we may conclude that it was on the missing specimen.

Agraulis (Dione) vanillæ, Linn.

Bz. + 902. I. 25. 10. 25. = **1170**. Minas Geraës. "*P[apilio]*". At Discoberto, near João Pedro's house."

This specimen bears Westwood's number A. 20. Given in Westwood's list.

4. 11. 25. = **1171**. Minas Geraës. (As **559**.)

6. 12. 25. = **1172**. Rio de Janeiro. On the Corcovado Mountain. (As **667**.)

Bz. + a. 25. 2. 26. = **1173**. "Frexais" on the Brazilian label and "Frexaes" on the English label. Organ Mtns. Burchell sometimes wrote "Frexaes" for "Frechál."

Bz. + a. 25. 2. 26. = **1174**. "Frixais" on the Brazilian label and "Frexal" on the English label. Organ Mtns. Given in Westwood's list.

a. 25. 2. 26. = **1175**. "Frexaes." Organ Mtns.

p. 25. 2. 26. 4 = **1176-1179**. Organ Mtns. Between Frechál and Magé. Burchell sometimes wrote "Frexaes" for "Frechál." One specimen given in Westwood's list.

Bz. + p. 25. 2. 26. = **1180**. Between Frechál and Magé.

1. 3. 26. = 1181. (As 960.)
 12. 3. 26. = 1182. Rio de Janeiro. "Aqueduct."
 13. 3. 26. = 1183. Rio de Janeiro.
Bz. 13. 3. 26. = 1184. Rio de Janeiro.
 20. 3. 26. = 1185. Rio de Janeiro. "Along the Carioca Aqueduct."
Bz. 27. 4. 27. = 1186. Vicinity of S. Paulo.
 27. 4. 27. = 1187. Vicinity of S. Paulo.
Bz. 9. 6. 27. = 1188. Vicinity of S. Paulo.
 19. 6. 27. = 1189. Vicinity of S. Paulo. Given in Westwood's list.
Bz. + 19. 7. 27. = 1190. Vicinity of S. Paulo. Given in Westwood's list.
 29. 1. 29. = 1191. Porto Real (Nacional). "Caught on the bank of the Tucantins, while measuring the base-line."
Bz. 29. 1. 29. = 1192. Porto Real (Nacional). "Caught on the bank of the Tucantins, while measuring the base-line."
Bz. 16. 2. 29. = 1193. Porto Real (Nacional). "Papiliones (3) caught on the flowers of a Malva in the back yard." (See 660.) Given in Westwood's list.
Bz. 19. 2. 29. = 1194. Porto Real (Nacional).
 19. 2. 29. = 1195. " "
 4. 3. 29. = 1196. " "
 7. 3. 29. = 1197. " "
Bz. 23. 3. 29. = 1198. " "
 27. 3. 29. = 1199. " "

Westwood's list (A. 20) only gives six specimens in the whole of the above series. He placed it among the *Acræinæ* and named it "*Vanillæ*." Probably a supplementary list exists on a small slip of paper, as in the case of *Agraulis juno*, but this has yet to be found.

Agraulis (Dione) juno, Cram.

- Bz.* 553. V. [19. 10. 25.] 4 = 1200-1203. Minas Geraës. "*Papilionida*." "At Descoberto do Rio Novo."

Westwood's list, in his own handwriting, gives five, indicating that one specimen has disappeared or has lost its label.
Bz. + 819. I. 23. 10. 25. = 1204. Minas Geraës. "*Papilio*." At Descoberto.

This specimen bears Westwood's number A. 22.

- Bz.* + 901. II. 25. 10. 25. 2 = 1205, 1206. Minas Geraës. "*P[apilio]*." At Descoberto, near João Pedro's house."

30. 10. 25. = **1207**. Minas Geraës. "(In the forest). On the N.E. side of the arraial of São João de Nêpomucéna."
 4. 11. 25. 2 = **1208, 1209**. Minas Geraës. (As 559.)
 The list in Westwood's handwriting, which is probably perfect, gives three specimens of this date.
 Bz. + 7. 11. 25. = **1210**. Minas Geraës.
 16. 2. 26. 2 = **1211, 1212**. Organ Mountains.
 29. 1. 27. = **1213**. Vicinity of S. Paulo.
 24. 10. 27. = **1214**. Meiaponte to S. Joaquim (Joaq. Alves).
 Bz. + 28. 7. 29. = **1215**. Pará. "28. 7. 27" in Westwood's list.

The data of this species not only appear, as A. 22, in Westwood's *Acraëinæ*, but also separately on a small slip of paper. In the first of these lists, which is very incomplete and in a clerk's handwriting, he describes the species as "like *Vanillæ*, but darker," while the second list, which is altogether in Westwood's writing, and probably perfect, bears the heading "Dark under winged Fritillary."

Colænis julia, F.

- Bz. 144. II. [16. 8. 25.] 2 = **1216, 1217**. Rio de Janeiro. "*Pap[ilio]*. Above the Teresa Convent; and on the woody hilly [hills] along the Aqueduct."
 Bz. 334. I. [15. 10. 25.] = **1218**. Minas Geraës. "*Papilio*. At the Discoberto do Antonio Velho... (144)."
 This number (144) refers to specimens **1216, 1217**, which Burchell thus recognized as the same species. This is given in Westwood's list.
 Bz. 554. III. [19. 10. 25.] 3 = **1219, 1220, 1220 A**. Minas Geraës. "*Pap[ilio]*." (As 1200.)
 Bz. + 994. VIII. 27. 10. 25. 7 = **1221-1227**. Minas Geraës. "*Papilio*. At San João de Nepomucena and on the road from Discoberto."

Opposite number 994 Burchell gives eight specimens dated 27. 10. 25, making no mention of specimen **1221**, labelled in England 26. 10. 25, and also bearing the Brazilian number 994. The latter date is evidently a clerical error, and is interpreted above as 27. 10. 25. Compare **1145**.

4. 11. 25. 2 = **1228, 1229**. Minas Geraës. (As 559.)
 29. 12. 25. = **1230**. Rio de Janeiro. Catombí—Bárta Vermélha—and Rio Comprido.
 a. 25. 2. 26. = **1231**. "Frexal." Organ Mountains. Burchell sometimes wrote "Frexal" for "Frechál."

7. 3. 26. 5 = 1232-1236. Rio de Janeiro. "At Catombí."
This date is given in Westwood's list, but only for two specimens.

No. 1234 bears Westwood's number A. 16.

- Bz. + 7. 3. 26. = 1237. Rio de Janeiro. "At Catombí."

10. 3. 26. = 1238. "

- Bz. 10. 3. 26. = 1239. "

- Bz. 12. 3. 26. = 1240. " "Aqueduct."

Mentioned in Westwood's list.

12. 3. 26. 2 = 1241, 1242. Rio de Janeiro. "Aqueduct."

13. 3. 26. 3 = 1243, 1244, 1245. Rio de Janeiro. One specimen mentioned in Westwood's list.

16. 3. 26. = 1246. Rio de Janeiro. (As 647.)

20. 3. 26. 6 = 1247-1252. Rio de Janeiro. "Along the Carioca Aqueduct."

- Bz. + 25. 8. 27. = 1253. Ollaría to Rio Pardo.

25. 8. 27. = 1254.

3. 3. 28. = 1255. Goyaz. "Caught in the town by the rio Vermelho by C[ongo]."

28. 4. 28. = 1256. Goyaz. (As 748.) Mentioned in Westwood's list.

- Bz. + 14. 4. 29. = 1257. Porto Real [Nacional].

- Bz. + 15. 4. 29. = 1258. Porto Real. "

12. 8. 29. = 1259. Pará.

Westwood's list (A. 16) only gives six specimens of this species in his list of *Acræinæ*. His description of it is thus:—
"*Cethosia*? orange red with oblique brown bar in f. w." We may surmise the existence of a second list, now missing, giving the remainder of the dates, as in the case of the previous species.

Colænis phærusa, Linn.

- Bz. 14. 4. 27. = 1260. In the Campo beyond Bóá Mórte.
Near S. Paulo.

This specimen bears Westwood's number A. 15, and his list adds another example, captured 13. 5. 29 at Carolina, on R. Tocantins, between Porto Real and Pará. Westwood described this as a "*Cethosia* (*Carolina*?) red buff with brown bars and white spots on margin of h. w." He placed it, as A. 15, among the *Acræinæ*.

Metamorphia dido, Linn.

12. 3. 26. = 1261. Rio de Janeiro. "Aqueduct."

17. 3. 26. = 1262. Rio de Janeiro. Along the Carioca Aqueduct. (See 917.) "*Papilio*: The green species
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frequents the tops of trees are [and] flies generally high above reach." [This note evidently refers to *M. dido*, though the specimen bearing the date 17. 3. 26 does not carry the no. 1057. The latter, however, is borne by a specimen of *Papilio agavus*, Drury.] Westwood's list gives one specimen bearing 1057 and two with 17. 3. 26. The former and one of the latter are now missing.

Bz. 20. 3. 26. = 1263. Rio de Janeiro. "Along the Carioca Aqueduct."

1. 4. 26. = 1264. Rio de Janeiro. "In the valley of Catumbi."

This specimen bears Westwood's number A. 19.

Bz. + 1316. 17. 2. 29. = 1265. Porto Real. "Feeding on the flowers of the *Waltheria* bushes (v. H. 8632X)." (See 663.)

1316. 17. 2. 29. = 1266. As above.

Westwood made two lists of this species, in one of which he mentions only one specimen on this date, while four are recorded on the other.

2. 3. 29. = 1267. Porto Real.

7. 3. 29. = 1268. Porto Real. "The green papilio loses much of the beauty of its green color within a day or two after being caught." It is certain that the "green papilio" is *Metamorpha dido*, Linn., as Burchell gives the above note on a specimen dated 6. 3. 29. The specimen is now lost, but is mentioned by Westwood in his list of this species. See also 1262, where this "*Papilio*" is described as "the green species." The green pigment is not contained in scales, but exists between the two membranes of the wing, being almost certainly the blood or hæmolymph in a solid state, and the colour due to metachlorophyll or some other modified plant-pigment. Green markings caused in this manner are also found in *Victorina stelenes* and several true Papilioninæ of the *sarpedon* group, also in the Pierine genus *Nepheronia*, although in this case the green colour is concealed by the opaque superficial scales. The rapid change of tint noted by Burchell is clearly associated with this unusual development of pigment between the wing-membranes, and it is probably caused by desiccation.

Bz. 9. 3. 29. = 1269. Porto Real.

10. 3. 29. = 1270. Porto Real. "Lepidoptera began to appear more numerous in the end of Feby, and since the beginning of this month they appear abundant."

Westwood's list mentions another specimen captured on this date.

Bz. + 13. 3. 29. = 1271. Porto Real.

18. 3. 29. = 1272. „

Bz. + 21. 3. 29. = 1273. „

23. 3. 29. 2 = 1274, 1275. „

Bz. + 23. 3. 29. = 1276. „

Bz. + 25. 3. 29. = 1277. „

Westwood's list does not mention any individual caught on this date, but one taken 22. 3. 29,—probably an erroneous rendering of 1277.

28. 3. 29. = 1278. Porto Real.

Bz. + 28. 3. 29. = 1279. Porto Real.

22. 4. 29. 2 = 1280, 1281. „

Bz. + 22. 4. 29. = 1282. „

7. 8. 29. = 1283. Pará.

Westwood's list adds two more individuals captured at Porto Real 26. 2. 29 and 6. 3. 29. See note on 1268.

The data of this species appear, as A. 19, in Westwood's list of *Acraïnae*. Opposite the very imperfect records Westwood had written "Ceth. Dido." Another list, on a small slip of paper, is in Westwood's handwriting, and this contains all the data here recorded except those of 1261. This separate list is headed "*Dido*."

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VII. *HELICONIINÆ*.

Mr. J. C. MOULTON having left England in order to undertake the curatorship of the Sarawak Museum, I suggested to Mr. E. G. Joseph, of Lincoln College, Oxford, the preparation of an account of further groups of Burchell's Brazilian butterflies. To this Mr. Joseph readily assented, and, in the course of the work, I have had abundant opportunities of witnessing the great patience with which he has performed this laborious task and his success in doing justice to the wonderful accuracy and powers of observation of the illustrious naturalist.

E. B. POULTON.

The following paper forms the continuation of the valuable publications of Mr. J. C. Moulton on Burchell's Brazilian *Nymphalinae* and of Miss Cora B. Sanders on the earlier subfamilies.

In the nomenclature and succession of the species of *Heliconiinae* I have followed Stichel's monograph in Wytsman's 'Genera Insectorum'¹, and have only departed from

¹ 37th Fascicule of the 'Genera Insectorum,' edited by P. Wytsman. Lepidoptera, Rhopalocera; Fam. Nymphalidæ, Subfam. *Heliconiinae*, 1906.

his arrangement by splitting up *Heliconius nanna* into two subspecies.

The whole of the Heliconiinae in the Hope Department have been worked out and arranged, according to Stiche's monograph, by Mr. W. J. Kaye, F.E.S. I owe a deep debt of gratitude to this distinguished authority on the group, not only for the specific determinations, many of which are of great difficulty, but also for kind help and advice on special points which arose in the course of the work.

The arrangement of numbers and dates is explained in detail on pp. 37 and 38. A further explanatory statement is quoted from p. 67:—"Notes, other than numbers and dates, written on labels attached to the specimens are placed between inverted commas immediately after the numbers in heavy type, and immediately before the locality." "When a specimen bears a number only, the date, recovered from Burchell's note-book, is placed between square brackets. 'a.' and 'p.' associated with the date stand for 'A.M.' and 'P.M.'"

The geographical data and notes as to the characters of certain localities are in many cases more complete and detailed in the following paper than in any of the preceding. This is a result of the study of the earlier manuscript volumes of Burchell's Catalogue of Brazilian Plants, containing the numbers 701-5336. Quotations from this source are distinguished by a terminal asterisk, thus *. About half of the catalogue of Brazilian plants has thus been studied and the data copied, viz. from July 18, 1825, when Burchell first set foot in Rio de Janeiro, up to August 23rd, 1827, when he was near the Rio Pardo on the journey from S. Paulo to Goyaz. These volumes, now in the library at Kew, have been kindly lent to Professor Poulton, at first by Sir William Thiselton Dyer, F.R.S., and later by Colonel D. Prain, F.R.S. Professor Poulton hopes that the whole of the data from this source will be transcribed at no distant date and made available for future papers.

Professor Westwood's labels, whenever they have been found attached to the specimens, are quoted in full. The words "a Westwood's label" of course always imply that he was the writer. "Westwood's list," on the other hand, is the list prepared under his direction, and, in the great majority of groups, written by an assistant. The condition of this list, as regards the subfamily now under consideration, is set forth in the two following paragraphs.

Burchell's species of the genus *Heliconius*, together with a single *Eueides*, were included by Westwood in his list of

"Heliconidæ," described as follows on p. 34:—"The first section of the butterflies is written in Professor Westwood's own handwriting, and deals with the Heliconiidæ in the old broad sense, comprising the Ithomiinæ, the genera *Lycorea* and *Ituna* of the Danainæ, and the Heliconiinæ. Although in the form of rough notes and very difficult to disentangle, it is a model of accuracy. It records the whole of Burchell's notes written on the labels accompanying the specimens, but apparently none of the facts to be found in his manuscript note-books." Numbers are not assigned to the species, as they are in the lists written by an assistant. Westwood's brief accurate descriptions seize upon the characteristic points and frequently enable us to identify the individual specimens. Good examples of this are to be found in 1296-1300.

With the single exception of *Eueides tales pythagoras*, the species of the Heliconiine genus *Eueides* are included in Westwood's list of "Burchell's *Acræa* &c." The numbers and data in this list are written in a clerk's handwriting, the names or notes being inserted by Westwood himself. The data of *Eueides aliphera aliphera* and *E. lybia lybia*—the former very imperfectly copied into the above list—were also completely recorded by Westwood on a separate slip of paper. In the case of *E. tales pythagoras* Westwood was evidently at first misled by the mimetic resemblance, for he separated this species from its genus and placed it beside the *Heliconius* models in the list of "Heliconidæ." He ultimately recognized its true relationship and added the correct name.

E. G. JOSEPH.

Oxford, Dec. 4, 1909.

HELICONIINÆ.

1. Genus. HELICONIUS, Linné.

Section I. OPISOGYMNÆ.

Cohort i. SILVANIFORMES.

Heliconius narcæa narcæa, Godt.

Bz. 580. I. [21. 10. 25]. = 1284. Minas Geraes. "*Papilio*]. In a rossa at Discoberto, and along a channel (on the margin of the forest) which conducts water to the house." Burchell's manuscript catalogue of Brazilian plants records that he collected botanical specimens "on an Excursion into the Province of Minas Gerães, between 7th October 1825, and 15 Nov^r 1825." This

Catalogue, which exists in the Kew library, will be hereafter quoted as "Cat. pl. Braz. MSS.," while passages extracted from it will be indicated by an asterisk, thus:

29. 10. 25. = 1285. Minas Geraes. "In the forest on the S.E. side of S. João de Nepomucéna." Burchell's Cat. pl. Braz. MSS. gives the following general account of his travels between Oct. 27 and Nov. 14, 1825:—"In the Province of Minas Gerais on the Road between Porto d'Estrélla & the Descoberto do Rio Novo. From 27 October to 14 November 1825."*

According to Westwood's labels on 1290 and also according to his list, the date 29. 10. 25 was borne by an example of "*Hel. Eucrate* V[ar]"¹. The Burchell specimen 1285, which now bears this date, agrees, however, in every particular with individuals identified by Westwood as belonging to the type form of the species. It is probable, considering the remarkable accuracy of this distinguished naturalist, that labels have been accidentally displaced, and that 1285 originally bore the date 30. 10. 25, shown by Westwood's list as well as by its label on 1287 to have been attached to an example of the type form. The transpositions which may have occurred are suggested under 1294.

7. 11. 25. = 1286. Minas Geraes. "Between [Capt.] Amaro Leite's and Pillão, a fazenda"*. (See 128.) On Nov. 6th, at Capt. Leite's, Burchell noted, "The Comet clear and tail long"*; and at Pillão, on the following night, "The Comet very bright"*.

Professor H. H. Turner, F.R.S., kindly informs me that the comet referred to was "probably that denoted 1825v, discovered by Biela on July 19, 1825, and by Pons on July 5. It was visible for 12 months in all and was 'very conspicuous early in October' with a bifid tail 15° long. An elliptic orbit assigned, period 4386 years."

8. 2. 26. = 1287. Organ Mtns. "In a ride Northward to the Mule- and to the Cow-Curráls and to the Horse Curral and Milho Roça"*. Less detailed data have hitherto been given from the Geographical Catalogue.

A Westwood's label reads "Capt. No. 580; 30. 10. 5; 8. 2. 26; 7. 3. 26; 19. 3. 26." Westwood's list agrees with this label.

7. 3. 26. 2 = 1288, 1289. Rio de Janeiro. "At Catoml" Bz. 9. 3. 26. = 1290. Rio de Janeiro.

A Westwood's label reads: "Capt. 29. 10. 25; 7. 11. 5; 7. 3. 26; 9. 3. 26 (2 inds.); 13. 3. 26; 21. 3. 26 (2 inds.);

¹ Hübnér's *eucrate* is a synonym of *narcæa*, Godt.

1. 4. 26." Another Westwood's label bears the name "*Hel. Eucrate* V." Westwood's list agrees with these two labels, and, like the first, records an additional specimen with the date 9. 3. 26, and another with 21. 3. 26.

Bz. 13. 3. 26. = 1291. Rio de Janeiro.

19. 3. 26. = 1292. Rio de Janeiro. "In the valley of Catombí." A Westwood's label reads, "*Heliconia Eucrate* [*Isabellina*]¹." The parentheses are Westwood's.

21. 3. 26. = 1293. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's list records one other specimen of this date.

10. 12. 29. = 1294. Pará. Data erroneous.

This date is omitted from Westwood's list and from his labels on 1287 and 1290. It is erroneous, not only on the evidence of Westwood's records, but because the date indicates a locality considerably to the north of that in which all the other captures of this species were made by Burchell, as well as to the north of the locality (South Brazil) given by Stichel².

In attempting to reconstruct Burchell's original labelling, assistance may be derived from 104, a specimen of *Mechanitis polymnia*, now bearing the date 30. 10. 25, indicating a locality considerably to the south of that in which the other individuals of this species were captured. Reasons were given on p. 48, for believing this label to be probably erroneous, and it was, moreover, suggested that the date on one of the additional specimens of *M. polymnia*, recorded by Westwood, viz. 3. 3. 28 or 10. 12. 29, was originally borne by 104. Now the latter of these dates is at present erroneously borne by the *Heliconius* 1294, to which it may have been accidentally transferred from 104. If we furthermore suppose that 1285 (type form) bore the date 30. 10. 25, now on 104, and 1294 (variety) bore 29. 10. 25, now on 1285, the labelling of these three specimens would agree with Westwood's records and with the probable localities of both *Heliconius* and *Mechanitis*.

Westwood's list and labels on 1287 and 1290 give the following dates not now to be found on any existing specimen of *H. narcæa*:—30. 10. 25, Minas Geraes (see above); 1. 4. 26, Rio. Two other additional specimens are referred to under 1290.

Opposite to the data "No. 580 ; 30. 10. 25 ; 8. 2. 26 ;

¹ H. W. Bates's *isabellinus* is placed by Stichel as a subspecies of *numatus*, Cram., allied to *narcæa*.

² Bahia and Espirito Santo are the actual localities in S. Brazil cited by Stichel.

7. 3. 26; 19. 3. 26," Westwood had written in the lit: "*Heliconia Eucrate* (*Isabellina*): al. ant^s. dimid^o. basali fulo fascia obliqua nigra ad apicem cellulæ—macula subapicali alba." Similarly opposite to the data "29. 10. 25; 7. 11. 2; 7. 3. 26; 9. 3. 26. 2 ind^s.; 13. 3. 26; 21. 3. 26. 2 ind.; 1. 4. 26," he had written: "Ejusd. var. (*Eucrate*) fascia media interrupta maculari. 9 ind^s." Nine of the fourteen Burchell specimens were thus separated as a variety, but, as pointed out under 1285 and 1294, the first date, "29. 10. 25," is now borne by an example of the type form, having been accidentally transferred since the time when Westwood's list was prepared. It is worth remarking that Westwood drew attention to the fact that one individual of the type form and one of the variety were caught on the same day, 7. 3. 26, by connecting the two copies of this date with a line.

Heliconius narcæa polychrous, Feld.

- a. 29. 8. 27. = 1295. Between R. Pardo and R. Gránle. "Cérvo to Paciência." "In the forest ascending he Morro de Batataes. *Papilionides*. In this forest Butterflies literally swarmed and thousands might have been caught in one day. I never saw such abundance in my life before."

A Westwood's label reads, "*Heliconia polychrous* Feller Pl. 47 f. 7." ["Lepidoptera of the Novara Expedition. Plates. (Reise der Oesterreichischen Fregatte Novan). Vienna. 1864-1867."]

Westwood's list agrees; and the following description is written opposite to the date of this specimen: "*Heliconia Polychrous* Felder: ant^s. alis intra cellulam flavo nec fulo-rufo variegatis."

[It is to be observed that, although Burchell captured this single specimen of *polychrous* rather to the north of the localities in which he took *narcæa*, Stichel gives S. Brazil for both forms, and it is probable that they fly together over a wide area. If this be true, according to the reasonable principles of Rothschild and Jordan, they are distinct species and not subspecies.—E. B. P.]

Heliconius numatus superioris, Butl., var.

- Bz. 4. 12. 28. ♀ = 1296. Porto Real. "Walk to the Igarapé." "*Papiliones*, caught in the woody campo; but the long-wing[ed] one is only found in forests in the shade."

It is exceedingly probable that the above-quoted description refers to this specimen (see 877 on p. 108). The "4"

of Burchell's *Bz.* label is partly torn away; but there is no real doubt about the figure, which Westwood also read as a "4."

Burchell's specimen (1296) departs from the pattern of *numatus superioris* as represented by Stichel in Wytzman's 'Genera,' p. 7, fig. 2, in the fact that the three subapical yellow spots, characteristic of the fore wing upper surface, are evanescent, although just visible. The faint indications of two additional pale spots nearer the apex can also be made out on the fore wing of 1296. These spots, which are more distinct and white on the under surface, resemble those figured in the var. *geminata* (Stichel, *l. c.* p. 7, fig. 3).

Westwood's list agrees: but he united this specimen and *Hel. ethilla numismaticus*¹ under one species, *Hel. numata* (see 1299). Opposite to the list of dates he wrote, "*Heliconia Numata*: maculis 3 flavis ad apicem alar. antic^m.: mac. marg. al. post. flavis."—Moreover, between the "3" and "flavis" he drew a diagrammatic representation of the three yellow spots. The patterns of the three individuals placed under *numata* by Westwood (1296, 1299, and 1300) are remarkably similar,—least so in the case of 1299, which he thought was perhaps a variety of this species. See also the observations made under 1299.

Heliconius silvana silvana, Cram.

15. 11. 29. = 1297. Pará. S. José. "Caminho de Chamonte." A Westwood's label reads, "*Hel. Sylvana*."

Westwood's list agrees, and the following description is written opposite to the date of this specimen: "*Heliconia Sylvana*: alis ant^s. ultra cellulam fasc. 2 macularibus flavis."

Heliconius silvana robigus, Weym.

21. 3. 26. = 1298. Rio de Janeiro. "Along the Carioca Aqueduct." A Westwood's label reads, "*Sylvanæ prop. Mac. 1 alba*."

By the last words Westwood undoubtedly refers to the large, conspicuous submarginal spot of the hind wing, which is also the first counting from the costa. This spot is, however, yellow and not white on the upper surface, as Westwood clearly pointed out when he described the same specimen (1298) in his list, writing opposite to the date 21. 3. 26:—"*Hel. Sylvanæ proximo*: alis ant^s. ultra cell. fascia subapicali flava: al. p. puncto unico flavo anguli externi." There is,

¹ In Stichel's classification, which is here followed, *numatus* is separated from *ethilla* by *silvana*.

in fact, no white marking on the upper surface of 1298, but, on the under surface, the corresponding spot is white. It is of course possible that Westwood was referring to the under surface in his label attached to the specimen, but it seems on the whole more probable that "alba" was inadvertently written instead of "flava." There can be no doubt that the words of the label and the list refer to the same specimen, viz. 1298.

Heliconius ethilla numismaticus, Weym.

29. 7. 29. = 1299. Pará.

Westwood, in his list, described this specimen as varying from the typical "*Hel. Numata*," and wrote opposite to it "Ejusd. [i. e. *Hel. Numata*] var.??: fascia obliqua nigra al ant. ante fasc. flavam, maculisq. marg. alar. post. subtus flavis nec albis."

Westwood's description is, as is nearly always the case, absolutely correct, and affords convincing evidence that there has been no accidental transference of data. This conclusion not only holds for 1299, but for all five *silvana*-like specimens, 1296-1300, which Westwood grouped in a manner very different from that here adopted from Stichel. No part of this difference is to be explained by subsequent accidental transposition of Burchell's labels.

18. 12. 29. = 1300. "in sylvis umbrosis." Pará. "Rivulet above Arsenal." A Westwood's label reads, "*Hel. Numata*."

Westwood's list agrees: for his description of this specimen see 1296.

Cohort iii. MELPOMENEFORMES.

Heliconius melpomene thelxiope, Hübn.

Bz. + 2. 20 p. 22. 5. 29. = 1301. Rio Tocantins. Just S. of, and the day before reaching, the Itabóca cataract.

7. 6. 29. 2 = 1302, 1303. On the Rio Tocantins, just above (S.W. of) Pará. "Sta. Anna."

The large yellow and somewhat constricted spot towards the end of the cell in the fore wing of this subspecies is much reduced and divided at the constriction into two spots in 1302, and is altogether absent from 1303.

Westwood also noted the condition of this feature in 1302 and 1303, as is shown by the following description written opposite to their dates in his list:—"Thelxiope var. [1303] var. ult^æ. præcedentis [i. e. of the typical '*H. Thelxiope*']

mac. in cellula al. ant. oblitterata." "*Thelxiope* var. [1302] simillima [to 1303] sed macula parva bipartita flava in cellula al. ant." He also described the first specimen [1303] thus: "Al. ant. absq. mac. flav. in cellula. 1 [individual]"; and noted that these varieties were "both taken on same day,"—7. 6. 29. Westwood does not record these two specimens on his label, probably because of their variability from the type. (Sec 1312.)

18. 6. 29. 2 = 1304, 1305. Pará.

A Westwood's label on 1304 reads "*Heliconia Thelxiope* Hubn. S. Ex. Sch. pl. 12. and Var without detached spot." Plate 12 is in vol. i. of J. Hübner's 'Sammlung exotischer Schmetterlinge,' Augsburg, 1806.

The detached spot between the first and second median nervules of the fore wing is absent from 1305, but not from 1301-4; its absence or abnormally small size will be noted in each case under the corresponding number.

Bz. + 18. 6. 29. = 1306. Pará.

Detached spot absent except for a minute trace. Westwood's list records one other specimen of this date.

20. 6. 29. = 1307. Pará.

1. 7. 29. 2 = 1308, 1309. Pará. "Walk to the Caza de Pao."

The detached spot is small on the left side, and exists only as a minute point on the right of 1308. It is altogether absent from 1309. An additional small yellow spot occurs in the centre of the fore wing cell of 1308. A Westwood's label on 1309 reads "*Helic. Thelxiop.*"

Westwood's list refers in the following note to the fact that two individuals of this species and two of *H. erato amazona* were caught on the same day:—"so that 2 ind^s. of this and 2 of the precedg. (♂ & ♀) were taken on same day 1. 7. 29." There can be little doubt that this note was intended to draw attention to the coincidence in habits between two species that were considered until quite recently to be very closely allied.

4. 7. 29. = 1310. Pará. Detached spot absent. Westwood had removed and mounted on a card, affixed to the pin, one of the anterior legs of this specimen.

12. 7. 29. = 1311. Pará. Westwood's label bears "♀."

29. 7. 29. = 1312. Pará. A Westwood's label reads, "Capt. 22. 5. 29; 18. 6. 29 (4 ind^s.); 20. 6. 29; 1. 7. 29 (2 ind^s.); 4. 7. 29; 12. 7. 29; 29. 7. 29 (2 ind^s.); 8. 12. 29."

Westwood's list records all the dates mentioned on this label, and similarly includes one other specimen with the

date 29. 7. 29. The list includes in addition and describes under "*H. Thelxiope* var." the two specimens caught on 7. 6. 29. (See 1302-3.)

8. 12. 29. = 1313. "In sylvā." Pará.

Westwood's list agrees except for the differences above alluded to. Opposite to the list of dates he wrote: "*Helio. The[?]xiope*: alis post. fasc. obliqua fusca ad marg. anal. extensa ♂ & ♀." In the same place he thus describes a variation of the above: "*Thelxiope* variat. macula postica oblitterata." It is evident that by "macula postica oblitterata" Westwood referred to the "Var. without detached spot" mentioned under 1304.

Heliconius nanna nanna, Stich.

Heliconius nanna of Stichel (l. c.), but here distinguished from the following subspecies, *H. nanna burchelli*.

6. 12. 25. ♂ = 1314. Rio de Janeiro. "On the Corcovado Mountain." "In an excursion to the Summit of the Corcovado by the road by the Convent of S^{ta}. Theresa and along the Aqueduct." The Cat. pl. Braz. MSS. contains the following full account of the localities in which Burchell collected, Dec. 6th, 1825 (the catalogue numbers of the botanical specimens are omitted): "On the Corcovado Mountain. On the Summit, and in the Forest which clothes the highest part of the Mountain... Along the more open part of the road, from the forests to the head of the Aqueduct... Along the upper end of the Aqueduct, as far as the spot where the road crosses it to the northern side, and where the collection of 15. 9. 25 ended..."*

There is no trace of a yellow spot at the end of or above the fore wing cell.

Heliconius nanna burchelli, Poulton¹.

2. 3. 29. ♂ = 1315. Porto Real. The male type of the subspecies. "*Papilio*. The brown winged (*Horcia*)

¹ [*Heliconius nanna burchelli*, subsp. n. When studying Burchell's Heliconiinae with the author of this memoir, I observed that the single specimen (1314) of *H. nanna*, Stich., from Rio, where Burchell took large numbers of *H. erato phyllis*, differed from the five individuals (1315-1319) taken by him to the north-west of the area in which he captured the species last named.

In the single specimen of *nanna* from Rio, the lower hind marginal border of the oblique red bar, forming the most conspicuous feature of the fore wing upper surface, is produced into two well-marked projections or

with a red patch on the upper wings, is always found in shady woods and forests. I have seen it in similar situations in every part of Brazil I have visited."

The yellow spot above the end of the fore wing cell is very distinct in this specimen.

In the above quotation from the Brazilian note-book, the description of "the brown winged (*Horta*)" applies not only to *Hel. nanna*, but also to *Hel. erato phyllis*, which latter Burchell collected in large numbers in Rio de Janeiro and its vicinity (see 1356-1409 A). Although these two species belong to different sections of the *Heliconiinae*, and are only distantly related, their superficial likeness to each other is so striking and their habits are evidently so essentially similar that Burchell, who was an extraordinarily acute observer, considered them to be a single species, widely distributed throughout the parts of Brazil visited by him. Until the

teeth, much resembling the form of the same marking in *erato phyllis*. Above the outer projection there is to be seen, on the external border of the bar, another minute tooth, resembling the step-like break which is more or less developed at the corresponding point in the bar of *erato phyllis*.

In all five individuals taken outside the area in which Burchell captured *erato phyllis*, the margin of the bar has a very different appearance, the tooth-like form being wanting, or, in the case of the lowest point, represented by a shortened and more rounded projection. The margin is in this respect very similar in all five specimens. Furthermore, in four individuals out of the five, a yellow spot, lying between the costa and the distal end of the fore wing cell, is more or less distinct. This spot is wanting from the Rio specimen (1314), although present in some of the fifteen individuals on which Riffarth's description is based (Berliner ent. Zeit. 1901-2, vol. xlv. p. 106).

Mr. W. J. Kaye has kindly allowed me to examine three specimens of *H. nanna* from his collection, and I find that they are consistent with Burchell's. Two (a female from Rio and a male from Espirito Santo) resemble 1314: one (a female from V. Nivac, Matto Grosso: Nov. 1904) resembles 1315-1319. The latter possesses the yellow spot, and the "teeth" are even more rounded off or flattened down than in Burchell's specimens.

Mr. Guy A. K. Marshall, who kindly examined the material in the British Museum for me, finds that two specimens of *H. nanna* from Pernambuco and two from Itaparica (an island off Bahia) resemble 1314, while one, in the Godman-Salvin Collection, from Chapada, is of the other form. Specimens of *H. erato phyllis* exist in the British Museum or Godman-Salvin collections from Bahia, Pernambuco, and still further north.

There is no doubt that Stichel's *nanna* is the form with the toothed bar from the area of *H. erato phyllis*. I have not been able to consult the original description (Ent. Zeit. Guben. vol. xii. p. 143), but, in his monograph in the 'Genera Insectorum,' Stichel gives South Brazil as the range, and Espirito Santo and Minas Geraes as localities. He further-

last few years the two species have never been distinguished by any systematist, and they are still unseparated in every collection that has failed to take into account the researches of Riffarth and Stichel. The remarkable character of the resemblance will be realized when it is remembered that Westwood, having before him the whole series of 69 Burchell specimens (including 6 *H. nanna*), wrote on a label affixed to 1395,—“69 individuals in full of this species without any variation of the least importance taken betⁿ. 24. 10. 25 & 24. 3. 29. See list in my Burchell Catalogue.”

[In attempting to understand Burchell's use of the name “*horta*” it is important to ascertain the various forms to which he applied it. These are as follows:—

- (1) True Heliconiinae, such as *H. nanna* and *H. erato phyllis* (see 1315).
- (2) The Ithomiinae, *Mechanitis lysimnia* or *Ceratinia deti*.

more indicates that the *nomen nudum* “*bidentatus*” of Staudinger's lists, applies to *H. nanna*. The toothed bar of *H. nanna* is also carefully described by Riffarth (in *Berliner ent. Zeit.* 1901–2, vol. xlv. p. 106), and by Stichel and Riffarth in ‘*Tierreich*,’ vol. xxii. p. 134 (Berlin, 1905).

I therefore suggest the name *burchelli* for the subspecies in which the lower end of the red bar crossing the fore wing is not toothed or bears only a trace of the lower tooth. This subspecies is found over an area of unknown extent lying to the north and west of the Brazilian range of *H. nanna nanna* and *H. erato phyllis*.

♂ type from Porto Real (Nacional) on the R. Tocantins: captured Meh. 2, 1829, by W. J. Burchell: (1315) in Hope Department, Oxford University Museum.

♀ type from Villa Nivac, S.E. of Matto Grosso (Nov. 1904), in coll. W. J. Kaye.

H. nanna burchelli appears, as Mr. W. J. Kaye has suggested to me to be a form of *H. melpomene amandus*, Grose-Smith and Kirby, from Bolivia and Peru. Mr. Kaye has kindly given me the opportunity of examining two males of this species from the Mapiro R., E. Bolivia. Both of these possess the yellow spot usually found over the end of the fore wing cell in *H. nanna burchelli* and sometimes in *nanna nanna*. The only essential difference between the two forms is due to the loss in *burchelli* of nearly the whole of the red area within the fore wing cell of *melpomene amandus* and the distal lengthening in the former of the yellow hind wing band of the latter. Another closely related form is, as Mr. Guy Marshall suggested to me, *H. amaryllis rosina*, Boisd., from Colombia, Panama, and Costa Rica. This subspecies is, however, without the longitudinal yellow streak which is so conspicuous a feature in the basal half of the fore wing of *melpomene amandus* and the forms of *nanna*.

It is probable that all the forms mentioned in the preceding paragraph will prove to be subspecifically related, *melpomene amandus* bearing this relationship to *amaryllis rosina* in the north and to *nanna burchelli* in the east. However this may be, there can be no doubt that *nanna nanna* is a geographical race of *burchelli*, produced to the east and south of the latter, under the influence of *H. erato phyllis*.—E. B. P.]

(For this use of the name "*horta*" see 97 and 108 on pp. 47 and 49 respectively.)

(3) The Ithomiinæ with transparent wings, such as *Pteronymia euritea*, *Pteronymia hemixanthe*, and *Heteroscada yanetta*, as the following note, in the Cat. pl. Braz. MSS. 701-3461, shows :—"1287. Ex Liatrideis. Planta herbacea erecta 5-ped. floribus albis. Hanc quoque vidi in Minas Geraës copiosè, ubi frequentatur a variis Papilionibus ex genere *P. Hortæ*, alis diaphanis."* We also find under the date Feb. 24, 1826, when Burchell was collecting "Between the foot of the [Organ] Mountains and Frechal," the following entry :—"2577. Syngenesia. Flores albi . . . Delicatus papilionum variarum, sed præsertim ex genere *P. hortæ*."* The name "*Horta*" occurs in reference to 39, and the white-flowered *Liatridea* under 36¹, but the above more detailed descriptions from the Cat. pl. Braz. had not been found when the account of these early numbers, 36, 39, &c. was prepared for publication.

(4) The abundant South-African *Acræa horta*, Linn., captured in large numbers by Burchell. There are now in the Hope Department at least 15 specimens taken by him, Jan. 1, 1815, at the Buffeljaght's River, near Swellendam.

On his return home Burchell named his African collection by comparison with the Banksian cabinet, then in the rooms of the Linnean Society, now at the British Natural History Museum. His notes exist at Oxford, and show that he obtained from this source the name "*P. Hortæ*" for the common S. African *Acræa*. The manuscript bears the following interesting heading :—

"The following notes are the result of a collation of the whole of my African collection of insects, with the Banksian Cabinet (now belonging to the Linnæan Society) the greatest part of which is named in the handwriting of Fabricius. 1823 to 1824." The words "but I fear some labels had been misplaced." were added at a later date.

In the Banksian cabinet it can now be seen that the African *Acræa horta* stands as one of the group "*Heliconii*," in which are included not only *Acræinæ*, but *Heliconiinæ* and *Ithomiinæ*—in fact, all the subfamilies to which Burchell applied the term "*Horta*" or of which he wrote "belonging to the genus of *P. Hortæ*." The evidence now brought together makes it clear that by "*Horta*" Burchell meant to imply a place in the Fabrician "*Heliconii*," the group headed by *Acræa horta*, a species well-known to him before he started,

¹ See p. 41.

in 1825, on his Brazilian expedition (Fabricius, Syst. Ent, Ins., 1775, p. 459. no. 69).—E. B. P.]

Bz. 2. 3. 29. ♂ = **1316**. Porto Real. (As **1315**.)

The yellow spot is altogether absent.

16. 3. 29. ♂ = **1317**. Porto Real.

A minute trace of the yellow spot.

24. 3. 29. ♂ = **1318**. Porto Real. "Mánga."

The yellow spot distinct.

Bz. + 24. 3. 29. ♂ = **1319**. Porto Real. "Mánga."

The yellow spot minute.

Westwood's list agrees, but the dates will be found included among those of *Hel. erato phyllis* (see **1315** and the paragraph after **1409 A**).

Section II. OPISORHYPARI.

Cohort iv. EGERIFORMES.

Heliconius burneyi burneyi, Hübn.

20. 9. 29. = **1320**. Pará. "S.E. of S. Joze." A Westwood's label reads, "*Heliconia Burneyi*. Hb. Zur. f. 401. 2." [J. Hübner and C. Geyer's 'Zuträge zur exotischer Schmetterlinge.' Augsburg. 1818-1831.

Westwood's list agrees. Opposite to the date he wrote, "*Heliconia Burneyi*: al. ant. maculis flav. mediis."

Cohort viii. ANTIOCHIFORMES.

Heliconius antiochus zobeide, Butl.

25. 8. 29. = **1321**. "intra urbem." Pará. S. José.

A Westwood's label reads, "*Heliconia Antiocha* Var. without yellow stripe on median vein and white middle bar broken in centre."

Westwood's list agrees with this label: and the following description is written opposite to the date: "*Heliconia Antiocha* var.: blue black f. w. with 2 white oblique stripes." The white bar referred to in the label is the lower and more median of the two stripes on the fore wing, mentioned in the list.

Heliconius sara sara, F.

(Probably not a Burchell specimen.)

8. 11. 29. = **1322**. Pará. "S. of S. José."

Westwood's list includes this date, but it is almost certain that Burchell's label has here become associated with a

butterfly never taken by this naturalist, having been accidentally transferred from a specimen of *H. sara thamar* which should follow 1346. Mr. W. J. Kaye, who originally determined 1322, has again carefully examined it at our special request. He still believes, and we agree with him, that 1322 did not come from any of the localities visited by Burchell, but from the range of *sara sara*, given by Stichel as Venezuela, Colombia, and Panama (?).

Westwood places the date of 1322 (three examples) in a list which includes, under the name *sara*, both the following subspecies. Of these three examples only one (1346) can now be found. There is no example of *H. sara thamar* without data in the Hope Department which can now be pointed out as likely to have been captured by Burchell; and the specimen which originally bore the Burchell label of 1322 is probably lost.

Heliconius sara apseudes, Hübn.

28. 10. 25. = 1323. Minas Geraes. "In the Forest on the West and on the East side of S. João de Nêpomucéna." (See 1285.)

6. 12. 25. = 1324. Rio de Janeiro. (As 1314.)

7. 3. 26. 2 = 1325, 1326. Rio de Janeiro. "At Catombí."

7. 3. 26. = 1327. "Catombi." Rio de Janeiro.

9. 3. 26. = 1328. Rio de Janeiro.

Bz. 9. 3. 26. = 1329. Rio de Janeiro. The last figure of the year, which is rather like an "8," is shown by examination with a lens to be a "6,"—a conclusion also adopted in Westwood's list, which is in his own handwriting.

Westwood's list records one other specimen of this date.

12. 3. 26. = 1330. Rio de Janeiro. "Aqueduct."

Westwood's list records one other specimen of this date.

16. 3. 26. = 1331. Rio de Janeiro. "In the upper part of the valley of Catombi, and along the road thence to Rio Comprido and Matto Porcos."

Bz. 16. 3. 26. = 1332. Rio de Janeiro. (As 1331.) The last figure of the year is here, as in 1329, somewhat like an "8," but Westwood's and our own examination agree in reading it as a "6."

Bz. 17. 3. 26. = 1333. Rio de Janeiro. "Along the Carioca aqueduct, and descending the high hill (mentioned 31. 1. 26) into the Valley of Catombi. But they were mostly along the aqueduct; and only a few on the hill."

For the data of 31. 1. 26, see 1378.

Bz. 18. 3. 26. = **1334**. Rio de Janeiro. "Along the Carioca aqueduct."

21. 3. 26. = **1335**. Rio de Janeiro. "Along the Carioca Aqueduct."

A Westwood's label reads, "Capt. 28. 10. 25; 6. 12. 25; 7. 3. 26 (3 ind.); 9. 3. 26 (3 ind.); 12. 3. 26 (2 ind.); 16. 3. 26 (2 ind.); 17. 3. 26; 18. 3. 26; 21. 3. 26; 27. 3. 26 (2 ind.); 1. 4. 26; 3. 4. 26 (3 ind.); 28. 10. 27; 29. 7. 29 (2 ind.); 6. 9. 29 (2 ind.); 20. 9. 29; 8. 11. 29 (3 ind.)." Westwood's list agrees with this label.

27. 3. 26. = **1336**. Rio de Janeiro. "From the Village of São Domingos to the island of Boa Viagem." "On the main-land about Fort Boa Viagem." "In a walk from the village of São Domingos to the Island of Boa Viagem and along the shore of the Mainland eastward for about half a mile." * In addition to this, the (at. pl. Braz. MSS. contains the following more detailed account of the localities in which Burchell collected on this date: (the catalogue numbers of the botanical specimens are here omitted:) "... In the village of São Domingos ... Between São Domingos and Boa Viagem. ... Along the shore of the bay; from Boa Viagem eastward to where the high rocky cliffs obstruct the path farther, excepting at low water." *

Bz. 27. 3. 26. = **1337**. Rio de Janeiro. (As **1336**.)

3. 4. 26. 2 = **1338, 1339**. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. 3. 4. 26. = **1340**. Rio de Janeiro. "Along the Carioca Aqueduct."

Besides the additions above alluded to, Westwood's list and label on **1335** give 1. 4. 26, Rio de Janeiro.

It has already been mentioned (see **1322**) that this form is included with the following subspecies under *Hel. sara* in Westwood's list.

Heliconius sara thamar, Hübn.

Bz. + 28. 10. 27. = **1341**. "Sylv." is on the Bz. label, "in sylva" on the English label. Between Meia Ponte and Goyaz. "S. Joaquim to Sapezal."

Bz. 29. 7. 29. = **1342**. Pará.

Westwood's list records one other specimen of this date
6. 9. 29. = **1343, 1344**. Pará. "Walk [to] a rocinha near the Nazareth church."

20. 9. 29. = **1345**. Pará. "S.E. of S. Joze."

8. 11. 29. = **1346**. Pará. "S. of S. Jozé."

Westwood's list records two other specimens of this date. It is probable that the label of one of the missing specimens was accidentally transferred at some unknown date to 1322. It may have been so transferred before Westwood's list was written; for 1322, no less than the two subspecies which follow it, would have been formerly identified as *H. sara*.

Except for the above-mentioned discrepancies, Westwood's list agrees. Opposite to the list of dates he wrote the following brief description, which is equally applicable to all three subspecies:—

"*Hel. Sara*: blue black with middle & subap^l. yellow bar in f. w. 30 [individuals]."

Cohort ix. ERATOFORMES.

Heliconius erato amazona, Staud.

19. 5. 29. = 1347. On the Rio Tocantins. "Araguáy." [S. João da Araguay.] The town of S. Francisco appears in modern maps opposite to the confluence of the R. Araguay with the R. Tocantins.

A Westwood's label reads "*Helic. Vesta?* Cram. pl 119 [fig.] A." The "?" has been erased in the same Indian ink as that in which the words are written,—therefore probably by Westwood himself. Plate 119 is in vol. ii. of P. Cramer's 'Papillons Exotiques des trois Parties du Monde, l'Asie, l'Afrique, et l'Amerique. Amsterdam and Utrecht. 1779-1791.' Cramer's *vesta* is a synonym of several of the subspecies of *erato*, Linn., including *erato amazona*.

It is to be noted that there is on the fore wing of this specimen a yellow spot below the first submedian nervule which is not found on any of the other individuals of this species captured by Burchell. This specimen is also peculiar in that the outer part of the red area below the cell of the fore wing upper surface bears a white V-shaped mark, more strongly developed on the right side.

20. 6. 29. = 1348. Pará.

This date is omitted from Westwood's list and from his label on 1352, but appears under *Eueides tales pythagoras* (see 1437).

1. 7. 29. 2 = 1349, 1350. Pará. "Walk to the Caza de Pao."

In the case of both 1349 and 1350, Westwood had removed and mounted on a card, affixed to the pin, one of the anterior legs. A Westwood's label on 1350 reads "*Heliconia Vesta*."

7. 7. 29. = **1351**. Pará. "Eastward of my house." The yellow spot at the apical end of the fore wing cell is divided into two in this specimen.

Westwood's list and label record one other specimen of this date.

29. 7. 29. = **1352**. Pará.

A Westwood's label reads "Capt. 19. 5. 29; 1. 7. 29, 2 ind^s.; 7. 7. 29, 2 ind^s.; 8. 7. 29; 29. 7. 29; 1. 8. 29; 15. 11. 29; 1. 2. 30." Westwood's list agrees.

Bz. + 1. 8. 29. = **1353**. Pará.

15. 11. 29. = **1354**. Pará. S. José. "Caminho de Clamonte."

1. 2. 30. = **1355**. "At Pará. In the forest S.S.E. of S. Jozé." The yellow spot at the apical end of the fore wing cell is here, as in **1351**, divided into two, and the costal member of the pair is only vestigial.

Besides the addition above alluded to, Westwood's list and label give 8. 7. 29, Pará. It is possible that he here accidentally includes the date on **1442**, a specimen of *Euedes tales pythagoras*, omitted from his list of this latter species (see **1442**). Opposite to the list of dates he wrote "*Heliconia Vesta*. Al. ant. mac. flava obliqua ♂ & ♀"—and he made a diagram showing that he referred to the oblique yellow spot between the first and second median nervules. In the same place he thus describes the variation in size of the spot in the cell of the fore wing:—"variat. magn. mac^a. flavæ in cellula al. ant."

Heliconius erato phyllis, F.

Bz. 147. II. [16. 8. 25.] = **1356**. Rio de Janeiro. "Lap-
[ilio]." "In a walk along the Aqueduct. Mile and a half above the Convent of Santa Theresa, at Rio de Janeiro—in Brazil." * Less detailed data have hitherto been given from the Brazilian note-book; it should be noted, however, that the latter reads: "129-154. Above the Theresa Convent; and on the woody hilly [hills] along the Aqueduct."

Westwood's list records two specimens bearing the number 147.

Bz. 316. I. [14. 10. 25.] = **1357**. Minas Geraes. "Pá-
pilio." Burchell notes that at 7.10 P.M. on this day he "arr.[ived] at Discoberto do Senora do Antonio Veho."
"I killed a reddish snake and preserved it. V. J." *

¹ Burchell's Brazilian Journal has unfortunately never been found. "V. J." stands for "Vide Journal."

(See 1284). He remained here till 27. 10. 25, when we find in his Cat. pl. Braz. "Leave Discoberto and arrive at S. Jao de Nepomucena." *

Bz. 357. I. [15. 10. 25.] = 1358. Minas Geraes. "*Papil* [io]. At the Discoberto do Antonio Velho." (See 1284.)

Bz. 562. I. [19. 10. 25.] = 1359. Minas Geraes. "*Pap* [ilio]." "At Descoberto do Rio Novo." * This is the "Discoberto do Antonio Velho" of the Brazilian notebook. (See 1284.)

Opposite "357" and "562" Burchell wrote "(147)," indicating his conclusion that these numbers were affixed to specimens of the same species.

Bz. + 853. I. 24. 10. 25. = 1360. Date as well as number on English label. Minas Geraes. "*Pap*[ilio]. About João Pedro's, at Discoberto: at the margin of the forest." (See 1284.)

Westwood's list refers to this specimen by its date alone.

29. 10. 25. = 1361. Minas Geraes. (As 1285.)

30. 10. 25. = 1362. Minas Geraes. "(In the forest). On the N.E. side of the arraial of São João de Nêpomucéna." (See 1285.)

6. 11. 25. 2 = 1363, 1364. Minas Geraes. "At Capt. Amáro Leite's." * (See 1286.)

7. 11. 25. 2 = 1365, 1366. Minas Geraes. (As 1286; and see 1285.)

Westwood's list records one other specimen of this date.

6. 12. 25. 2 = 1367, 1368. Rio de Janeiro. (As 1314.)

Westwood's list includes three specimens with this date.

The third is of course an example of *Hel. nanna* (1314.)

24. 12. 25. = 1369. Rio de Janeiro. "Aqueduct (on the first hill on the left)." The following full account of Burchell's movements on this date is given in the Cat. pl. Braz. MSS. 701-3461:—"Along the Aqueduct. Mostly on the first hill on the left, or S.E. side of the aqueduct . . . ; and in the thick woods, . . . on the same hill, quitting the aqueduct by the first opening or valley just above the stone quarry. Above the stone quarry . . ." * (The dotted lines represent the omitted catalogue numbers of Burchell's botanical specimens.)

29. 12. 25. 2 = 1370, 1371. Rio de Janeiro. "Catombí—Barra Vermélha—and Rio Comprido." "On a hill westward of Catombí, along a road turning southward out of the main road at Barra Vermelha to the Fazenda da Ladeira . . . and further along the main road to Rio Comprido . . ." * (The dotted lines represent the omitted catalogue numbers of Burchell's botanical specimens.)

10. 1. 26. = **1372**. Rio de Janeiro. "At Praia Grande and vicinity, and about S. João de Carahý." "In a walk from Praia-Grande to the Village of São João de Carahý and 2 miles further." * He also speaks of "the level inundated country beyond São João" *; and "along the road beyond the last mentioned level." *

Bz. + 11. 1. 26. = **1373**. Rio de Janeiro. "At Laranjeiros."

Westwood's list records one other specimen of this date.

14. 1. 26. 2 = **1374, 1375**. "Laranjeiros." on both labels. Rio de Janeiro. "Brought from and collected in the Valley of Laranjeiros. Omnia insuper plantas."

14. 1. 26. 2 = **1376, 1377**. Rio de Janeiro. (As **1374**.)

Westwood's list records one other specimen of this date.

31. 1. 26. 2 = **1378, 1379**. Rio de Janeiro. "Valley of Catombý and a high Mountain on the N.W. side of the Aqueduct." "All of this date were from off plants: mostly up the Valley of Catumbi." "Along the Valley of Catumbi and ascending a high Mountain on the N.W. side of the Aqueduct of Carióca." *

In addition to this, the Cat. pl. Braz. MSS. 701-3461 contains the following more detailed account of the localities in which Burchell collected on this date (the catalogue numbers of the botanical specimens are omitted, as indicated by the dotted lines):—" . . . In the Lower part of the valley, as far as the last houses . . . Along the Catumbi Aqueduct, to the head of the valley where it crosses it by a high wooden trough . . . In the ascent, from the head of the valley of Catumbi, up the high Mountain on the N.W. side of the aqueduct of Carióca . . . Along the Aqueduct of Carióca." *

Westwood's list records one other specimen of this date.

- Bz. + 31. 1. 26. = **1380**. Rio de Janeiro. (As **1378**.)

9. 2. 26. = **1381**. Organ Mtns. "By the River Pacaqué (near Mr. March's Dwelling House)." *

12. 2. 26. = **1382**. Organ Mtns.

7. 3. 26. 2 = **1383, 1384**. Rio de Janeiro. "At Catombi."

- Bz. 7. 3. 26. = **1385**. Rio de Janeiro. "At Catombi."

9. 3. 26. 3 = **1386, 1387, 1388**. Rio de Janeiro.

- Bz. 9. 3. 26. 2 = **1389, 1390**. Rio de Janeiro.

10. 3. 26. 5 = **1391-1395**. Rio de Janeiro.

A Westwood's label on **1395** reads, "69 individuals in full of this species without any variation of the least importance taken betⁿ. 24. 10. 25 & 24. 3. 29. See list in my Burchell Catalogue." Westwood's list agrees with this label. It has already been pointed out that Westwood was here including two very different species. (See **1315**.)

Bz. 10. 3. 26. = 1396. Rio de Janeiro.

12. 3. 26. 2 = 1397, 1398. Rio de Janeiro. "Aqueduct."

Westwood's list records one other specimen of this date.

12. 3. 26. = 1399. "Carioca Aqueduct." Rio de Janeiro.

15. 3. 26. = 1400. Rio de Janeiro. "Catombi, in plantis."

Bz. 17. 3. 26. = 1401. Rio de Janeiro. Carioca aqueduct.
(As 1333.)

18. 3. 26. = 1402. Rio de Janeiro. "Along the Carioca aqueduct."

20. 3. 26. = 1403. Rio de Janeiro. "Along the Carioca Aqueduct."

21. 3. 26. = 1404. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. 21. 3. 26. = 1405. Rio de Janeiro. "Along the Carioca Aqueduct."

22. 3. 26. = 1406. Rio de Janeiro. "Along the [Carioca] Aqueduct, nearly as far as its commencement at the head of the valley of Larangeiros." * The latter word is usually spelled "Laranjeiros" by Burchell.

Bz. 1. 4. 26. = 1407. Rio de Janeiro. "In the valley of Catumbi."

Westwood's list records one other specimen of this date.

Bz. 19. 9. 26. = 1408. Santos.

Bz. 30. 4. 28. = 1409. Goyaz.

—————. = 1409 A. This is probably a Burchell specimen which has lost its label; for it has precisely that appearance of age which is a characteristic of many Burchell specimens, but of no other example of this species in the Hope Department. The label appears to have been lost since Westwood's list was prepared, for no mention is there made of a specimen without data. The missing date may have been that of any one of the additional specimens of *H. erato phyllis* to be inferred from his list.

Besides the additional specimens already mentioned, and the six examples of *Hel. nanna* (1314-1319), Westwood's list includes the dates 3. 4. 26 (Rio de Janeiro) and 5. 2. 28 (Goyaz), which have not been found on any specimen. They probably indicate the former existence of two additional examples of *Hel. erato phyllis*.

Opposite to the list of dates Westwood wrote:—" *Hel. Phyllis*. 69 ind^s."

2. Genus. EUEIDES, Hübn.

Section II. BRACHYSCENÆ.

Cohort ii. VIBILIFORMES.

Eueides vibilia vibilia, Godt.

20. 3. 26. ♂ = 1410. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's "Catal. A. 1" is on specimen, and on another label "*Meraui Eueides*." Westwood's list agrees with these labels. Hübner's *Colenis mereaui* is a synonym of *Eueides vibilia*, Godt.

22. 3. 26. b. ♀ = 1411. Rio de Janeiro. "Along the Carioca Aqueduct." The Brazilian note-book also adds: "Those marked *b* were purchased from some negro-insect-catchers, who caught them all in this spot & almost all were alive when I bought them." (See also 1406.)

Westwood's "Cat. A. 3" is on specimen, and on another label "*Eueides Vibilia*." Westwood's list agrees with these labels.

19. 3. 29. ♂ = 1412. Porto Real.

23. 3. 29. ♂ = 1413. Porto Real.

25. 3. 29. ♂ = 1414. Porto Real.

Westwood's "A. 1." (clerk's MSS.) is on specimen. Westwood's list agrees.

28. 3. 29. 2 ♂ ♀ = 1415, 1416. Porto Real.

Westwood's "A. 4." (clerk's MSS.) is on the ♂ (1415), —probably as the result of accidental transposition during manipulation. This number, in the list of "Burchell's *Acræa* &c.," stands for the mimetic Pierine butterfly "*Leptalis* [*Dismorphia*] *Astynome*." In the list itself the date 28. 3. 29 appears correctly under A. 1. and A. 3., and not under A. 4.

5. 4. 29. ♂ = 1417. Porto Real.

- Bz. + 5. 4. 29. ♂ = 1418. Porto Real.

Westwood's list, A. 1. and A. 3., agrees. Opposite to the dates of the seven males, placed under A. 1., he wrote "*Euides Meraui*"; while underneath 20. 3. 26 "*Meraui Eueides*" appears in clerk's MSS. Similarly, opposite to the dates of the two females (22. 3. 26 *b* and 28. 3. 29, under A. 3.) Westwood wrote "*Euides Vibilia*." It is to be observed that Westwood omitted the second "*e*" of "*Eueides*" from his list of "*Acræa* &c.," but not from his labels.

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A Revision of the Family PANTOPHTHALMIDÆ [Diptera],
with Descriptions of New Species and a new Genus.
By Major E. E. AUSTEN, D.S.O., F.Z.S.

(Text-figures 1-11.)

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(a) *Introduction and Acknowledgments.*

In spite of, as compared with the vast majority of Diptera, imposing size and striking coloration—characters likely to attract the attention of collectors in countries in which the flies forming the subject of this paper are found—*Pantophthalmidæ* (formerly known as *Acanthomeridæ*) are singularly rare in collections. It is difficult to suggest even a possible reason for this, unless it is to be found in the habits of the adult insects, which probably spend most of their time in the depths of Neotropical forests.

At the present moment the series of these great Diptera in the British Museum (Natural History), though doubtless the most extensive in any collection in Europe, consists of only sixty specimens. These, however, include no fewer than twenty-four examples from the collection of the late M. J. M. F. Bigot, which Mr. J. E. Collin, F.E.S., has most generously presented to the National Collection during the preparation of this paper. The fact that among M. Bigot's series of specimens are the types of five species, described by himself, Macquart or Bellardi, renders this addition peculiarly valuable, and its timely acquisition has enabled the writer in the course of subsequent pages to elucidate for the first time a considerable amount of synonymy. It is therefore a pleasant task hereby to express to Mr. Collin, on behalf of the Museum, sincere thanks for his public-spirited and most welcome gift.

Acknowledgments are also due to Professor E. B. Poulton, F.R.S., F.Z.S., for the kind loan of the *Pantophthalmid* material,

amounting to twenty specimens, in the Hope Department of the Oxford University Museum; and to Dr. Hugh Scott, F.E.S., for similarly allowing the author to examine a female of *Pantophthalmus chuni* Enderl. and a larva (represented in text-fig. 1, on p. 557) of *P. tabaninus* Thunb., both of which are the property of the University Museum of Zoology, Cambridge.

It only remains to add that, unless otherwise stated, all specimens mentioned in the following pages, including the types of new species, are in the British Museum (Natural History).

(b) Bibliography.

Apart from descriptions of genera and species already published, references to which will be found in the "Systematic Portion" (h) of this paper, the more important items comprised in the scanty literature of Pantophthalmidæ are the following:—

- BRAUER, FR.—Description of a dried larva of *Pantophthalmus* (*Acanthomera*) *frauenfeldi* Schin. Denkschr. K. Akad. Wiss., Math.-Naturw. Cl., Bd. xlvii. p. 25, Taf. ii. figs. 25 a–25 e (Wien, 1883).
- OSTEN SACKEN, Baron C. R.—"Fam. Acanthomeridæ." Biol. Centr.-Amer., Diptera, vol. i. pp. 63–68 (1886).
- FIEBRIG, K.—"Eine morphologisch und biologisch interessante Dipterenlarve aus Paraguay (*Acanthomera teret truncum* sp. n. Fiebrig)." Zeitschr. f. wiss. Insektenbiologie, Bd. ii. pp. 316–323, 344–347, figs. 1–19 (1906).
- WILLISTON, S. W.—"Family Acanthomeridæ." Manual of N. Amer. Diptera, 3rd Ed., pp. 173–175, figs. 2, 61, 62 (London: Wm. Wesley & Son, 28 Essex Street, Strand, 1908).
- ENDERLEIN, G.—"Die Dipteren-Familie Pantophthalmidæ." Zool. Anzeiger, Bd. xli. pp. 97–118, figs. 1–15 (1912).
- ENDERLEIN, G.—"Weitere Beiträge zur Kenntnis der Pantophthalmiden." Zool. Anzeiger, Bd. xlv. no. 13, pp. 577–586 (July 28, 1914).
- HERMANN, F.—"Ein neuer *Pantophthalmus* nebst kritischen Bemerkungen über die Systematik der Pantophthalmiden (Dipt.)." Deutsche Ent. Zeitschrift, Jahrg. 1916, pp. 43–49, Abt. 1, 2 (1916).

(c) Geographical Distribution.

Pantophthalmidæ are confined to the Neotropical Region, where, however, their range is wide, extending from Mexico to Paraguay, and including at least a portion of the West Indies. It is true that, as pointed out by Osten Sacken (*loc. cit.* p. 66), Thunberg's statement (*cf. infra*, p. 562) as to the provenance of the type of *Pantophthalmus tabaninus*—the first species of this family to be described—"still requires confirmation." Neverthe-

less, considering that some eleven years ago the same species (subsequently regarded by Knab as new, and described by him under the name *Pantophthalmus fastuosus*) was found by Mr. F. W. Urich breeding in Trinidad; that, as is well known, the Dipterous fauna of the West Indies generally is "essentially a common one, with a strong South American facies" *; and that the islands of the Lesser Antilles are only separated one from another by short intervals of sea—there can be no real reason to doubt the accuracy of Thunberg's century-old assertion that the type of this species came from St. Barthélemy I.

(d) *Taxonomic Position.*

Williston ('North American Diptera,' 3rd Ed., p. 175, 1908), who places the "Family Acanthomeridæ" between Stratiomyidæ and Tabanidæ, writes:—"The relationships of the family are very close indeed to the Stratiomyidæ, and the families might, very properly, be united." Kertész, however, in vol. iii. of his 'Catalogus Dipteriorum,' published in the same year, gives the families embraced by the volume in the following sequence: Stratiomyidæ; Erinnidæ (Xylophagidæ); Cœnomyiidæ; Tabanidæ; Pantophthalmidæ; Rhagionidæ (Leptidæ *olim*). Enderlein, on the other hand (Zool. Anz., Bd. xli. p. 97, 1912), considers that, from a phylogenetic standpoint, the Pantophthalmidæ are extraordinarily closely allied to the Xylophagidæ and Cœnomyiidæ, and that the morphological relations between all three are so pronounced that they might be regarded as groups belonging to a single family, namely the Xylophagidæ. The latter would then be divided into the subfamilies Xylophaginae, Cœnomyiinae, and Pantophthalaminae. Remarking that the presence or absence of spines on the scutellum, the relative size of the head and differences in bodily shape, whether slender or thickset, furnish insufficient grounds for the separation of families, Enderlein proceeds to show with the help of a diagram that in venation also the differences between Pantophthalmidæ, Xylophagidæ, and Cœnomyiidæ are unimportant. Hermann, in his paper published four years later, while criticising Enderlein somewhat severely in connection with other details, nevertheless (Deutsche Ent. Zeitschr., Jahrg. 1916, p. 47, 1916) expresses his complete agreement with him (and disagreement with Kertész) in respect of the closeness of the relationship between the Pantophthalmidæ, regarded as a family, and the Xylophagidæ and Cœnomyiidæ.

There can be no doubt that the views of Enderlein and Hermann as to the systematic position of the Pantophthalmidæ are correct, and indeed, in order to be satisfied upon this point, it is only necessary to compare two representative species, such as *Pantophthalmus pictus* Wied. and *Xylophagus ruficeps* Lw.

In view of the life-history of Pantophthalmidæ (*vide infra* (f))

* Williston, Trans. Ent. Soc. Lond. 1896, p. 445 (1896).

it is perhaps worth while to recall that the preliminary stages of Xylophagidæ and Ctenomyiidæ are also associated with trees, albeit in a dead or mouldering condition, the larvæ, which in the case of the two latter families are carnivorous and predaceous, living in decaying wood and under bark.

(e) *Bodily Dimensions in Pantophthalmidæ compared with those of Exceptionally Large Diptera belonging to other Families.—Giantism.*

Although, as will be seen directly, in wing-expanse, and of course in length of leg, Pantophthalmidæ are surpassed by certain Tipulidæ of abnormal size, while length and wing-expanse in the largest species are about the same as or somewhat below the corresponding dimensions of the largest representatives of the Mydæidæ, the members of the present family as a whole are undoubtedly by far the *bulkiest*, and therefore the largest of all Diptera.

Among slenderly built Diptera, the largest forms are to be found in the Tipulidæ, wherein, as regards actual size, certain species of the genus *Ctenacroscelis* Enderlein are probably without existing rivals. Thus, a male belonging to a variety of *Ctenacroscelis brobdignagius* Westw., from China (N.-W. Sze Chuen), just over 39 mm. ($1\frac{1}{2}$ inch) in length, has a wing-expanse of 104 mm. (rather more than 4 inches), while the outstretched legs cover an area at least $6\frac{3}{4}$ inches in length by 5 inches in breadth.

Although the family Mydæidæ includes a number of species, the representatives of which are of moderate dimensions, certain members of the genus *Mydas*, which are among the largest of Diptera, are relatively gigantic. By way of illustration, mention may be made of *Mydas pregrandis* Austen, a male of which from Brazil has a wing-expanse of 85 mm. (between $3\frac{1}{4}$ and $3\frac{1}{2}$ inches), while the length of this insect, exclusive of the long and prominent antennæ, is 48 mm. (between $1\frac{3}{4}$ and 2 inches)*. The dimensions of this species, in fact, as represented at any rate by the type and paratype (both males) in the National Collection, are but slightly larger than those of the somewhat aberrant representative of the Pantophthalmidæ originally described by the

* Writing with reference to what is almost certainly the female of this species, of which he gives a life-size illustration derived from a photograph, Williston (N. American Diptera, pp. 16, 17, fig. 1, 1908) furnishes considerably higher measurements, remarking:—"The largest specimen of a fly of which I have knowledge is that figured herewith natural size, pertaining to an indeterminable species of *Mydas* from South America. The length of this specimen from the tip of the antennæ to the extremity of the abdomen, is sixty-seven millimeters, or, omitting the antennæ, fifty-two millimeters: the expanse of wings one hundred and seventeen millimeters, or a little more than four and one-half inches. The smallest dipteran that I have ever observed in the examination of many thousand specimens and five or six thousand species, is a cecidomyid measuring a trifle less than one-half millimeter, also omitting the antennæ. In other words, the *Mydas* is more than one million times the size of the cecidomyid. Possibly there are still greater discrepancies between the largest and smallest specimens of the order, but in all probability not much."

author as *Rhaphiorhynchus rothschildi*, for which a new genus is erected in the present paper (cf. p. 596).

Turning to the Asilidæ, we find in this enormous family a wide range in size, and a considerable number of species which, though smaller than the larger examples of the genus *Mydas* such as that just mentioned, are yet of exceptional dimensions, some of the largest forms being met with, for example, in the genera *Proagonistes*, *Alcimus*, *Phellus*, *Blepharotes*, *Hyperechia*, and *Proctacanthus*. A male belonging to an undescribed species of *Proagonistes* from Madagascar, 41 mm. (between $1\frac{1}{2}$ and $1\frac{3}{4}$ inch) in length, has a wing-expanse of 80 mm. (between 3 and $3\frac{1}{4}$ inches); while, owing to the extraordinary length of the hind legs, the space from the tips of these, when outstretched, to those of the similarly extended front legs measures at least 82·5 mm. ($3\frac{1}{4}$ inches). The slender-bodied *Alcimus brevipennis* Ric., from Natal, has in the female sex a length of 44 mm. (just under $1\frac{3}{4}$ inch), though its wing-expanse amounts only to 55 mm. (between 2 and $2\frac{1}{4}$ inches). Among the much more stoutly built representatives of the Australian genus *Phellus*, a female from South Queensland, belonging to a species as yet undescribed, measures 50 mm. (just under 2 inches) in length inclusive of the ovipositor, and has a wing-expanse of 81 mm. (a little under $3\frac{1}{4}$ inches). The female of *Blepharotes coriarius* Wied., from the same region, may measure 42 mm. (between $1\frac{1}{2}$ and $1\frac{3}{4}$ inch) in length, and have a wing-expanse of 76 mm. (3 inches). Several of the species of *Hyperechia* are bulky-bodied flies of large size, one of the largest being *H. (Laphria) consimilis* Wood (syn. *Dasyllis usambare* Lichtwardt), of which the type (a female from Natal) is 33 mm. (over $1\frac{1}{4}$ inch) long, and has a wing-expanse of 62·5 mm. (very nearly $2\frac{1}{2}$ inches). Among narrow-bodied Asilidæ (sub-family Asilinae), an exceptionally large species is *Proctacanthus (Asilus) penultimus* Walk., the type of which—a male from India—is 40 mm. (over $1\frac{1}{2}$ inch) long, and has a wing-expanse of 60 mm. (between $2\frac{1}{4}$ and $2\frac{1}{2}$ inches).

Lastly, as regards Pantophthalmidæ other than the species already mentioned, the wing-expanse in the case of females belonging to the largest forms such as *Pantophthalmus bellardii* Bell. may amount to 84·5 mm. (a little over $3\frac{1}{4}$ inches), and the length over all (i.e. including the ovipositor but not the antennæ) to 54 mm. (over 2 inches); while the broad, flat abdomen may measure 22 mm. (considerably more than $\frac{3}{4}$ inch) in width at its widest point. In the female sex of certain other species, notably *Pantophthalmus tabaninus* Thunb., dimensions are often little below those just given. Species of Pantophthalmidæ however exist, in which, so far as it is at present possible to judge from the limited amount of material available for examination, the same standard of bodily development is not attained; and on the other hand there are indications that, in some cases at any rate (as, e.g. in *P. tabaninus*), the average size of the males is considerably less than that of the females.

The fact remains, however, that in the adult state dimensions in Pantophthalmidae as a whole are greatly in excess of the normal in Diptera, and this small group of large flies consequently forms an interesting case of the phenomenon known as *giantism*, concerning which Williston (*op. cit.* p. 17) writes as follows:—"Giantism in any group of animal life is a specialization, and is, in general, an indication of approaching decadence; enduringly small races are never the descendants of giants, for decrease in size means lessened vitality and incipient extinction. No strong or dominant group of flies, like the Tachinidae, Dolichopodidae, Syrphidae, or Bombyliidae, has ever had in the past a larger average bodily size than is found among their living representatives. On the other hand, those families composed to-day chiefly of large forms are ones already past their prime. These conclusions seem established for the larger forms of life, and I believe that they are in the main also applicable to insects."

(f) *Life-history and Bionomics.*

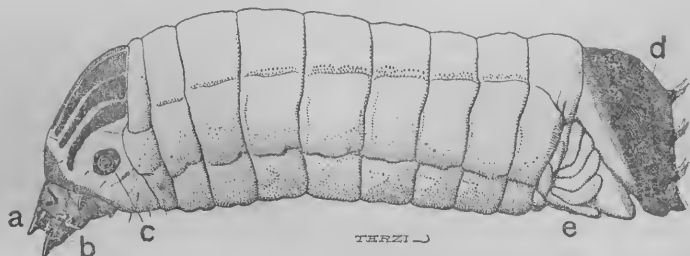
Until the year 1906, knowledge under this heading was limited to a brief, illustrated description by Brauer of a dried larva of *Pantophthalmus (Acanthomera) frauenfeldi* Schin. from Bogota (*cf.* "Bibliography," p. 552); and Osten Sacken's statement (*Biol. Centr.-Amer., Diptera*, vol. i. p. 66), published three years later on the authority of Mr. G. C. Champion, that "*Acanthomera* are found in forests, alighting on trunks of trees." In the year referred to, however, Karl Fiebrig, of San Bernardino, Paraguay, working under the disadvantages contingent upon isolation and lack of entomological literature, published a most interesting account (*cf.* "Bibliography," p. 552), illustrated by a series of figures, of the external and internal anatomy of the larva of *Pantophthalmus pictus* Wied. (*infra*, p. 575). From the larvæ found by him, Fiebrig succeeded in breeding out a pair of imagines, which, owing to the disadvantageous conditions just mentioned, he regarded as belonging to a new species, and accordingly described under the name *Acanthomera tere truncum*.

Thanks to Fiebrig's observations, which were actually made in 1905, and were confirmed seven years afterwards by Mr. F. W. Urich, in Trinidad, in the case of another species (*Pantophthalmus tabaninus* Thunb.), we now know that larvæ of Pantophthalmidae have the extraordinary habit—unique among Diptera, so far as the present writer is aware—of boring in the solid wood of living trees, in which they make "nearly horizontal" tunnels, and feed upon the exuding sap. Although Fiebrig does not mention the name of the tree in which he found his larvæ, he states that its wood is "among the toughest of Paraguayan timbers, hard as these in general are," and that the tunnels made by the maggots are "sharply gouged out."

In view of Fiebrig's detailed account, which should be consulted by the student, it is scarcely necessary here to do more than draw

attention to the accompanying figure (text-fig. 1), which displays the chief features in the external morphology of a larva—probably nearly adult—of another species of the genus *Pantophthalmus*. This larva, which is preserved in spirit, is 32.5 mm. (just over $1\frac{1}{4}$ inch) in length, while the average ventro-dorsal diameter of the body-segments is 9.75 mm. It was taken, with at least five other larvæ of the same kind, in the Island of Trinidad, B.W.I., in borings in the trunk of an *Erythrina*, a leguminous tree, which attains a height of from 15 to 20 feet.

Text-figure 1.



Larva of *Pantophthalmus tabaninus* Thunb. (lateral view), from boring in trunk of *Erythrina* tree (*E. corallodendrum* L. f.), Trinidad, B.W.I., March 1912 (F. W. Urich). $\times 2\frac{1}{2}$.—From specimen kindly lent by Dr. Hugh Scott, University Museum of Zoology, Cambridge.

a, labrum; *b*, left mandible; *c*, left anterior (prothoracic) spiracle or stigma; *d*, dorsum of 8th post-thoracic segment, which is very heavily chitinized; *e*, Fiebrig's "finger-shaped bodies"—in all probability an auxiliary respiratory apparatus, employed when the posterior stigmata are unable to function, owing to the larval tunnel being full of sap.

The stout labrum and the extremely powerful mandibles together form a "drill," by means of which the larva is able to bore in solid wood; the equally heavily chitinized dorsum of the 8th post-thoracic segment closes the tunnel from behind, and protects the larva from an attack in the rear. The posterior stigmata open on the posterior (ventral) surface of this segment, in a mouth-like chamber between it and the 9th post-thoracic segment, which bears the "finger-shaped bodies." When the latter segment is in the position shown in the figure, the posterior stigmata are completely closed.

In the adult *Pantophthalmid* larva, the number, size, and arrangement of the backwardly directed spines on the 8th post-thoracic segment perhaps afford characters of specific importance (cf. Brauer, *loc. cit.* Taf. ii. figs. 25 *a*, 25 *b*).

In the Trinidad larva, the longitudinal strips of chitin embedded in the integument of the prothoracic segment, to which the striped appearance of the latter is due, are reddish brown, while the powerfully developed labrum and mandibles, and the heavily chitinized dorsal surface of the 8th post-thoracic segment are deep black; the prevailing tint of the remainder of the body is that of old ivory. There can be little doubt, however, that prolonged immersion in alcohol has had a bleaching effect, since Fiebrig describes the nine "soft" body-segments in the larva discovered by him as "bluish green," owing to the "intense blue tint" of the abundantly developed fat-body; it is also worthy of

note that in life, according to the same author, the "finger-shaped bodies" (see text-fig. 1 and explanatory text) are bright green. The dorsal surface of the prothoracic segment, though far less heavily armoured than that of the 8th post-thoracic segment, nevertheless, strengthened as it is in the manner already referred to, is quite hard, and may well serve to protect the tunnelling larva against possible injury from sharp splinters of wood.

An interesting point with reference to the living larva of *Pantophthalmus pictus* is noted by Fiebrig, who writes that, "when in the tree-trunk it produces rasping sounds, distinctly audible up to a distance of some four paces."

The pupal envelope, according to the same observer, is vertically truncated at each end, "the anterior extremity being formed by a stout, richly sculptured plate of chitin," which serves to protect the pupa from a frontal attack. Although this armoured shield is not broken through by the imago in emerging, it may be that the facial "beak," that is so conspicuous a feature in many *Pantophthalmidæ* though not exhibited by all species, or always developed in both sexes, when present assists the fly in making its escape from the pupal envelope. The latter, we are told by Fiebrig, "after the emergence of the imago, projects about half-way out of the larval tunnel"; but the same authority is unable to state whether the pupa makes its way to this point by its own efforts, or whether the pupal envelope is dragged along with it by the escaping fly.

"Metamorphosis," writes Fiebrig, "appears to be very protracted. A larva 35 mm. in length, and apparently nearly full-grown, was kept under observation from July 31, 1905, onwards. The imago emerged in the afternoon of January 11, 1906, a few weeks before which date it was found that the insect was still in the larval state; this would point to a pupal stage of very short duration."

Whether larvæ of *Pantophthalmidæ* are of economic importance, as destroyers of timber of commercial value, is an interesting point which awaits determination. So far as can be ascertained, the wood of *Erythrina* (*E. corallodendrum* L.?), in which the larvæ of *Pantophthalmus tabaninus* Thunb. were found by Mr. F. W. Urich, in Trinidad, is of little or no utility. But the possibility of commercial value is at any rate not excluded in the case of the unknown Paraguayan tree referred to by Fiebrig, as to which we are told that the wood is exceedingly hard and extremely rich in sap, "yielding an abundance of evil-smelling fluid on being injured."

(g) *Pseudo-Parasites.*

Pseudo-parasites in the shape of Gamasid mites are of extraordinarily common occurrence on *Pantophthalmidæ*, and many instances of such infestation are recorded in the following pages. The mites, on being submitted by the author to his colleague Mr. A. S. Hirst, F.Z.S., for identification, were found by him in

every instance except one to be conspecific, and to be nymphs of a species of *Trachytes*, which Mr. Hirst will describe in a forthcoming paper as new (*cf.* p. 565). In the single case forming the exception, the pseudo-parasite was determined by Mr. Hirst as an adult female of *Macrocheles*, sp. incert. (*vide* p. 588). It would seem that these pseudo-parasites must infest the borings of the larvæ, and attach themselves to the flies as the latter emerge from the pupa-case.

(h) *Systematic Portion.*

Taking into account synonymy already established, the total number of species of Pantophthalmidæ at present recognized amounts to twenty-four. In the following pages ten species, previously described by various authors, are admitted as valid and commented upon, notes being given on the specimens of these species in the British Museum (Natural History), or otherwise available to the writer for examination; the names of nine other species, hitherto accepted, are sunk as synonyms; and six species and one genus are described as new. As the result of this paper, therefore, the number of known species of Pantophthalmidæ, including those that the author has been unable to examine, will stand at twenty-one. It is explained below that, in agreement with Kertész, and contrary to the course adopted by Enderlein, the genus *Pantophthalmus* Thunb. is treated as including *Acanthomera* Wied. In view of the limited amount of material at the author's command, and since as yet both sexes are known in the case of only a minority of species, with much regret no attempt has been made to construct a synoptic table. Should the publication of the present paper fortunately result in a considerable expansion of the National Collection of these interesting Diptera, the construction of a reliable table of the kind in question may eventually be possible.

Genus *Pantophthalmus* Thunberg.

Pantophthalmus Thunberg, Götheborgs Kongl. Wetenskaps och Witterhets Samhällets Nya Handlingar, iii. Delen, p. viii (1819).

Acanthomera Wiedemann, Diptera Exotica, Pars i. p. 60 (1821).

Megalomyia Bigot, Ann. Soc. Ent. France, 5^e Sér., T. x., Bull. p. v (1880).

Megalemyia Bigot, Ann. Soc. Ent. France, 6^e Sér., T. i. p. 455 (1881).

After due consideration, it has seemed better to follow Kertész (Cat. Dipt. iii. p. 294 (1908)), who gives the synonymy printed above, rather than Enderlein (Zool. Anz., Bd. xli. p. 100 (1912)), by whom *Pantophthalmus* Thunb. and *Acanthomera* Wied. are treated as generically distinct. The course adopted by Kertész appears the more reasonable one under the circumstances, in spite

of lack of complete agreement among the species mentioned or described in the following pages, in respect of certain structural details. Included among the latter are:—The degree of development of the facial “beak”; the shape of the terminal segment of the maxillary palpus; the shape of the terminal division of the third (compound) segment of the antenna in the female; and the presence or absence of a distinct subfemoral spine on the hind legs.

Although, by concentrating attention on one or other of these characters and disregarding the remainder, it would perhaps be possible in the case of certain species to select distinctions of apparently generic value, yet in other forms intergradations occur which make the drawing of a hard and fast line of demarcation impossible. Thus, to take only one of the characters referred to:—Enderlein (*loc. cit.* p. 99), writing of the terminal division (called by him the tenth segment) of the female antenna, says that this “in *Pantophthalmus* tapers gradually to a point, but in *Acanthomera* and *Rhaphiorhynchus* becomes but little narrower towards the end, and then, just before the tip, is suddenly pointed.” This statement is certainly true if we compare the antenna of the female in species such as *Pantophthalmus tabaninus* Thunb., or *P. bellardii* Bell. (both of which belong to *Pantophthalmus*, sensû stricto) with that of the female of e.g. *Pantophthalmus* (*Acanthomera*) *chuni* Enderl. But when we examine the antenna in the female of *Pantophthalmus pictus* (*Acanthomera picta*) Wied.—a species with a well-marked subfemoral spine, and the genotype of *Acanthomera*—we find that it is intermediate between the two conditions. Moreover, in the female of *Pantophthalmus vittatus* (*Acanthomera vittata*) Wied.—a species assigned by Enderlein himself (*loc. cit.* p. 107) to *Pantophthalmus*—the terminal division of the antenna is precisely of the type regarded by Enderlein as characteristic of *Acanthomera*.

As regards the maxillary palpus, the terminal segment of this structure is also subject to a certain amount of variation in shape in different species. Although usually slender and cylindrical, and, at least in the female sex, longer than the remainder of the palpus, it is sometimes shorter and also stouter, albeit never swollen in the manner characteristic of the terminal segment of the palpus in *Rhaphiorhynchus*.

That Enderlein is in error when he asserts (*loc. cit.* p. 100) that in *Pantophthalmus*, sensû stricto, the facial beak is represented merely by a “rounded tubercle-like swelling” is pointed out by Hermann (*Deutsche Ent. Zeitschr.*, Jahrg. 1916, p. 48 (1916)), who shows that in *P. alienus* Herm. the absence of a subfemoral spine on the hind legs is correlated with the presence of a “long, pointed, tooth-like facial process.” A further example of the condition seen in *P. alienus* Herm. is afforded by the new species described below as *P. batesi* (*cf.* p. 566), in the male of which, at any rate, while the facial beak, though small, is conspicuous and sharp-pointed, the posterior femora are either without a spine

on the under surface, or display the merest vestige of such a structure.

The truth is that characters such as those mentioned above, however valuable for the distinction of species, are of less than generic importance, and, were it necessary, many arguments in support of this contention might be furnished from the accepted taxonomy in other families of Diptera.

Among characters of *specific* importance in the genus *Pantophthalmus*, may be mentioned *wing-markings* and, although this does not apply to the males of certain species which have the thorax unicolorous or nearly so, *the markings on the dorsum of the thorax*.

Wing-markings, in spite of their general similarity (with certain exceptions) throughout the family Pantophthalmidæ, will be found, if close attention be paid to details, to afford useful assistance not only in the distinction of species, but in the correct association of the sexes of the same species—a matter in some cases probably of far greater difficulty. Osten Sacken, in the course of a valuable disquisition on structural peculiarities and characters of specific importance in Pantophthalmidæ (“*Acanthomeridæ*,” Biol. Centr.-Amer., Diptera, i. pp. 65–66 (1886)), does not refer to wing-markings, but writes as follows with regard to markings on the thorax:—“The arrangement of the stripes and spots on the thorax, an apparent monotony notwithstanding, offers excellent characters for the recognition of the species, and especially for the assorting together of male and female specimens of the same species.” As regards the value of thoracic markings for the association of the sexes of a given species, the statement just quoted is only partially true. It certainly holds good in the case of *Pantophthalmus tabaninus* Thunb. (the synonymy given on p. 562 below is based on and supported by the characteristic thoracic markings exhibited by this species), and *P. vittatus* (*Acanthomera vittata*) Wied. (as also in that of *Rhaphiorhynchus planiventris* Wied.); but it is entirely inapplicable to a species such as *Pantophthalmus pictus* (*Acanthomera picta*) Wied., in which the dorsum of the thorax is conspicuously striped in the female, but almost uniformly silvery, or at any rate without corresponding stripes, in the male. While the presence of sharply-defined, dark longitudinal stripes on the dorsum of the thorax (scutum) is characteristic of the female sex in *Pantophthalmus* (and also in *Rhaphiorhynchus*), there are, in addition to *P. pictus* Wied., at least three species, including one described for the first time in the following pages, in which, while the female is as yet unknown, the thorax in the male is without such stripes. In these species the dorsum of the male abdomen, be it noted, has a silvery sheen. It is to be hoped that males and females of the species in question may ere long be caught *in coitu*, or bred from larvæ or pupæ taken in the same tree-trunk, otherwise the correct association of the sexes in these cases may remain a matter of doubt for an indefinite period.

In addition to sexual dimorphism of the kind just referred to, difficulties of determination in this genus are increased by the fact that in the case of certain species (at any rate *P. tabaninus* Thunb. and *P. pictus* Wied.—see below) the female abdomen, at least in dried specimens, sometimes shows colour-dimorphism as well. Failure to realize the occurrence of this phenomenon led Enderlein into error in constructing his synoptic tables (Zool. Anz. xli. pp. 101, 107 (1912))—a fact which has already been pointed out by Hermann (Deutsche Ent. Zeitschr., Jahrg. 1916, p. 48 (1916)).

The number of species of *Pantophthalmus* recognized as valid in Kertész's 'Catalogus' (vol. iii. 1908) is fourteen. This total does not include *Acanthomera teretruncum* Fiebrig (= *Pantophthalmus pictus* (*Acanthomera picta*) Wied.), since the description of the latter (1906) appeared between the compilation and publication of the volume of the late Dr. Kertész's monumental work in which the Pantophthalmidae are included. Between 1908 and the present time, descriptions of nine species of *Pantophthalmus* supposed to be new have been published, including seven by Enderlein and one each by Hermann and Knab; while Enderlein has rightly sunk Fiebrig's designation *Acanthomera teretruncum* as a synonym, besides disposing of *P. helleri* Enderl. in a similar manner. Thus for the moment the number of species of *Pantophthalmus* assumed to be valid stands at twenty-two. In the following pages, however, the names of no fewer than nine of these are shown to be synonyms, while six species are described as new; so that, as the result of the present paper, the genus *Pantophthalmus* is to be regarded as consisting of nineteen recognized species.

The genotype is *Pantophthalmus tabaninus* Thunb.

Pantophthalmus tabaninus Thunb.

Pantophthalmus tabaninus Thunberg, *loc. cit.* p. vii (1819).

Acanthomera seticornis Wiedemann, Auss. zweifl. Ins. i. p. 108, Taf. ii. figs. 1 a–1 c (1828). [New synonym.]

Acanthomera heydenii Wiedemann, *op. cit.* p. 555 (1828). [New synonym.]

Acanthomera immanis Wiedemann, *op. cit.* ii. p. 623 (1830). [New synonym.]

Acanthomera rubriventris Bigot, Ann. Soc. Ent. France, 5^e Sér., T. x., Bull. p. v (1880). [New synonym.]

Pantophthalmus fastuosus Knab, Insec. Inscit. Mens. vol. ii. no. 2, p. 27 (February 1914). [New synonym.]

According to Thunberg (*loc. cit.*), the type of *P. tabaninus* was obtained in St. Barthélemy I., in the West Indies.

Among the synonyms recorded above, the name *Acanthomera seticornis* (like *Pantophthalmus tabaninus* itself) was originally applied to the ♂ insect, while the designations *Acanthomera heydenii*, *A. immanis*, and *A. rubriventris* were bestowed upon

the ♀. A study of the thoracic markings, which are characteristic of this species and present a striking agreement in both sexes, leaves no doubt as to the correctness of the synonymy here given. In spite of the fact that *Pantophthalmus gigas* Enderlein (Zool. Anzeiger, Bd. xli. p. 110, fig. 7 (1912)), described from the ♀ sex, is stated by its author (*loc. cit.*) to be devoid of pale spots on the lateral margins of the second and third abdominal tergites, it would seem not unlikely that this supposed species is also identical with *P. tabaninus* Thunb.

The representatives of *Pantophthalmus tabaninus* Thunb. at present contained in the British Museum (Natural History) are as follows:—One ♂, (?) Trinidad, B.W.I. (*G. Robertson—ex coll. W. W. Saunders*); one ♀, Venezuela, before 1847 (purchased from — Dyson); one ♀, Brazil, before 1849 (*Mrs. Noel*); one ♂, locality unknown (*ex coll. Alexander Fry*); one ♂, Trinidad, B.W.I., before 1878 (*Mrs. Cutter*); one ♂, Macapá, R. Amazons, Brazil, 25.ii.1896 (*E. E. Austen*), “on board Messrs. Siemens Bros. Cable S.S. *Faraday*”; one ♀, Nicaragua (*E. A. Burns*); one ♀, Colonia Hansa, Santa Catharina, Brazil (purchased from H. Rolle). Presented by Mr. J. E. Collin, F.E.S., from the Bigot collection, we also have the four specimens (including the type) of *Acanthomera rubriventris* Big., which are all ♀ ♀ from Guatemala; and two ♂ ♂ of *P. tabaninus*, likewise from Guatemala, which, in Bigot's series, were placed with a ♂ of *P. versicolor* Austen (see below), above the label “*Acanthomera seticornis*, Wied. ♂,” in Macquart's handwriting.

The Hope Department of the University Museum, Oxford, possesses two ♂ ♂ and two ♀ ♀ of *P. tabaninus*; of the former, one specimen is labelled “*seticornis* Wied.,” but is without any indication as to provenance, while on the label of the other is written “Pará. Higgins, 1868”; there is nothing to show the origin of the two ♀ ♀, which are labelled “*R. planiventris*.”

The Liverpool School of Tropical Medicine has a ♀ of *P. tabaninus* from Pará, Dec. 1922 (*Dr. Clarke*).

In this species, in which the female usually, although not invariably, much exceeds the male in size, the ground-colour of the dorsum of the abdomen ranges from cinnamon-rufous* or vinaceous-rufous to blackish-brown or black. The dark thoracic stripes are the same in all cases, and, at least in the specimens available to the writer for examination, the silvery-white triangular spot near each posterior angle of the second and third abdominal tergites is always visible, although in some individuals less conspicuous than in others. In the case of the type of *P. tabaninus*, which, from the details furnished by Thunberg, is evidently a male, the dorsum of the abdomen, according to the original description, is “brown”; Wiedemann (*loc. cit.*) describes the dorsum of the abdomen in *Acanthomera seticornis* as “vivid

* For names and illustrations of colours used for descriptive purposes in the present paper, see Ridgway, ‘Color Standards and Color Nomenclature’ (Washington, D.C. Published by the Author, 1912).

ferruginous-yellow" (sehr brennend rostgelb), and the same region in *A. immanis* as "ferruginous." In the type of *A. rubriventris* Big. the ground-colour of the first four abdominal tergites is between ferruginous and vinaceous-rufous, while the hind borders of the second and third tergites, and the hind border of the fourth tergite except its lateral extremities, are black. Of the three paratypes of *A. rubriventris*, one agrees with the type in the coloration of its abdomen, while in the case of the other two the dorsum of the abdomen is reddish-brown. In the series of specimens of *P. tabaninus* in the National Collection, other than those just mentioned under Bigot's designation *Acanthomera rubriventris*, the six males have the dorsum of the abdomen (except its basal angles and the lateral borders of the first three tergites, which are black in this sex) cinnamon-rufous, vinaceous-rufous, or ferruginous, while the venter is seal-brown. Of the four females comprised in the same series, one has the dorsum of the abdomen (except the lateral margins, which are black) dull amber-brown, while in the case of the other three individuals the corresponding region is for the most part blackish-brown; the venter in each specimen is dark seal-brown. Among the four examples of *P. tabaninus* in the possession of the Hope Department, University Museum, Oxford, the two males have the dorsum of the abdomen cinnamon-rufous, apart from the black lateral borders of the first three tergites, and the basal angles of the fourth tergite, which are brown or blackish-brown. In one of the two females in the Oxford collection, the dorsum of the abdomen, with the exception of the small silvery-white spot near each posterior angle of the second and third tergites, is uniformly velvety-black. The corresponding region in the other specimen is brownish black, with an ochraceous-tawny transverse area in the centre of the hind border of the first segment, extending on to the front margin of the second; on the latter segment there is also a deep, brownish-tawny, transverse band, which is not very sharply defined, and does not reach the lateral extremities of the tergite; on both the second and third tergites, in front of the hind margin, there is a black transverse band.

It is interesting to note that, in the case of one of the females of *P. tabaninus* in the National Collection (the specimen referred to above as having been taken in Brazil prior to 1849, by Mrs. Noel), the abdomen shows a very heavy infestation by nymphs of a Gamasid mite. The pseudo-parasites, which, in the dried condition at any rate, are light ochraceous-buff in colour, and measure about 0.4 mm. in length, are present to the number of many hundreds on the dorsal surface of the abdomen, where they are packed so closely as to form large patches, while quantities are to be seen crowded together beneath and partially concealed by the hind margins of the tergites. Further specimens of the mite, although in small numbers as compared with those on the dorsum, are also visible on the venter. The male *P. tabaninus* taken by the writer at Macapá, R. Amazons, 25.ii.1896, on

board the Cable S.S. *Faraday*, shows a considerable number of what is evidently the same pseudo-parasite on the dorsal surface of its abdomen, while many instances of similar infestation in the case of specimens of other species of Pantophthalmidæ are noted below. Since therefore, even among the limited series of these flies available to the author for examination, representatives of various species are infested in this manner, it would seem that for some reason members of this family are peculiarly subject to invasion by this Acarid. The author's colleague, Mr. A. S. Hirst, F.Z.S., to whom the mites have been submitted, has kindly supplied the following note:—"The pseudo-parasites are nymphs of a species of *Trachytes*, a Gamasid mite, and presumably are predatory forms, possibly feeding upon small mites or insects inhabiting the tunnel of the fly-larva. This habit of attaching itself to an insect host is no doubt of benefit to the mite, by widening its area of distribution."

Pantophthalmus frauenfeldi Schin.

Acanthomera frauenfeldi Schiner, Reise der österreichischen Fregatte 'Novara' um die Erde, Zool. Theil, Bd. ii. Diptera, p. 78 (1866).

Of this species, the National Collection possesses a ♀ from Bogota, Colombia (*ex coll.* — Stevens, 1856), in which country the type was obtained; and a second ♀, from Peru (*ex coll.* J. M. F. Bigot: presented by J. E. Collin). The latter specimen, with the type of *Acanthomera crassipalpis* Macq. (= *Rhaphiorhynchus planiventris* Wied.), and two other ♀♀ of *Rhaphiorhynchus planiventris* Wied., stood in the Bigot collection above the label "*Acanthomera crassipalpis*, Macq., n. sp. ♀," in Macquart's handwriting.

Including the facial beak and ovipositor, the original Museum specimen measures just over 31 mm. in length, instead of 35 mm., which is the length of the type (also a ♀) as given by Schiner. The total length of Bigot's example, measured in the same way, is 32 mm.

In the Hope Department, University Museum, Oxford, there is a solitary ♀ of *P. frauenfeldi* from Macas, Ecuador (purchased from Stevens, 1862). The dimensions of this specimen, which is very much larger than the examples in the National Collection, are as follows:—Total length, including facial beak and ovipositor, 42·25 mm.; greatest width of abdomen (across hind margin of second tergite) 16·25 mm.; wing-expanse 74·6 mm. The terminal segment of the palpi in the Oxford specimen is slender, straight and cylindrical, whereas the corresponding segment in the British Museum ♀ from Bogota is curved outwards at the tip and distinctly swollen towards the base; in the ♀ from the Bigot collection the palpi are damaged.

Two nymphs of the usual species of Gamasid mite (*cf.* remarks under *P. tabaninus* above) are visible on the dorsum of the abdomen of the ♀ from Bogota.

Pantophthalmus batesi, sp. n. (Text-fig. 2.)

♂.—Length (one specimen) 24 mm.; width of head 6.4 mm.; greatest width of abdomen (across hind border of second tergite) 8 mm.; length of wing 18.5 mm.

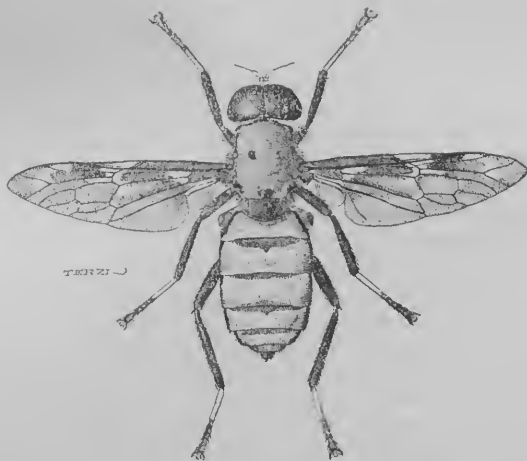
Relatively small and (in ♂ sex at least) somewhat narrow-bodied species, with, in ♂, a small but conspicuous, sharp-pointed facial "beak," unstriped thorax, and ochraceous-orange abdomen, which along each lateral margin bears a series of sooty-black spots or elongate blotches, and dorsal surface of which, except anterior borders of second to fifth segments inclusive, has from certain angles the appearance of burnished silver; wing-markings presenting a general resemblance to those of P. tabaninus Thunb., but with conspicuous differences, notably a curved pale mark connecting fork of third longitudinal vein with costa; posterior femora without, or with merest vestige of, a spine on under surface.

Head in ♂ sex more flattened in an antero-posterior direction than that of P. tabaninus Thunb., and consequently less hemispherical in outline when viewed from above; face, except beak, dusky drab; jowls and basi-occipital region clove-brown, clothed with similarly coloured hair; occiput olive-buff; facial beak blackish brown at base, distal attenuate portion chestnut-brown; palpi light sepia-coloured, darker towards distal extremities; second segment clothed beneath, towards distal extremity, with blackish-brown hair, terminal segment curved, slender, tapering to the tip; first and second segments of antennæ russet-coloured, first segment thinly clothed with brownish hair, second segment with some glistening orange-buff hair on distal margin (third segment missing in case of type). Thorax: ground-colour of dorsum cinnamon-drab, thinly suffused above with smoke-grey pollen, while lateral borders of dorsum are olive-buff pollinose; main portion of dorsum (scutum) marked with five dull-black spots, of which two, smaller than remainder and nearly circular, are situated on line of transverse suture, one on each side of middle line; remaining spots transversely elongate and situated on hind border, one in middle line, the other two occupying the postalar calli, except inner extremities of latter; scutellum dull-black or blackish-brown, anterior angles and lateral borders smoke-grey pollinose; pleuræ and pectus blackish-brown and*

* *Note on the number of segments in the maxillary palpus in Pantophthalmidæ.*—Fiebrig (Zeitschr. f. wiss. Insektenbiol., Bd. ii. p. 346, 1906), in describing the species named by him *Acanthomera teretiviscum* (= *Pantophthalmus pictus* (*Acanthomera picta*) Wied.), speaks of "the relatively long, three-jointed palpi." Williston (North American Diptera, 3rd Ed., p. 173, 1908), in a short general account of the "Family Acanthomeridæ," states that the palpi are "two-jointed." Lastly Enderlein (Zool. Anz., Bd. xli. p. 99, 1912) says that in Pantophthalmidæ, owing to the irregular transverse wrinkling of the palpus basad of the terminal segment, it is impossible to determine whether this portion is further segmented or not. There can be no doubt, however, that the maxillary palpus in this family consists of three segments, in which, while the second is often marked by conspicuous annuli or transverse wrinkles, the first owing to its shortness may easily be overlooked, although in many species distinguishable by darker coloration and a different arrangement of the hair.

clothed with fine similarly coloured hair, dorsum, and lateral extremities of pronotum. clothed with ochraceous-buff hair. *Abdomen*: first tergite with each lateral extremity broadly black, though just in front of hind margin of segment black area shows a deep indentation of ground-colour above and below; second and third tergites with a scutiform or elongate black spot occupying each anterior angle, extreme hind margins of posterior angles of second tergite also black; fourth tergite with anterior two-thirds of lateral extremities sooty black; lateral extremities of fifth tergite blackish-brown; sixth tergite entirely ochraceous-orange; a straight transverse band running right across fore border of fifth tergite devoid of silvery sheen; on each of the three preceding tergites corresponding non-silvered band tapers towards lateral extremities of the tergite, which it fails to reach,

Text-figure 2.

*Pantophthalmus batesi* Austen, ♂. $\times 1\frac{1}{2}$.

while its hind margin, which exhibits a backwardly directed projection in middle line, is more or less brace-shaped; lateral extremities of tergites clothed on dark areas with dark brown or blackish-brown hair, and elsewhere clothed with yellowish, cinnamon-coloured, or brownish hair, remainder of dorsum clothed with minute, scattered, and very inconspicuous cinnamon-buff hairs, which on sixth tergite are somewhat longer; venter orange-buff, partially suffused with a silvery sheen (especially distinct on first three sternites), and sparsely clothed with hair similar in colour to that on dorsum, but longer. *Wings* light sepia-coloured, marked as shown in fig. 2, the most conspicuous markings being those on the costal border, consisting of two irregularly shaped dark blotches and two cream-buff or pinkish-buff marks; of the latter, the one nearer the base of the wing,

which extends from the costa to the upper distal angle of the second basal cell and includes the anterior transverse vein, resembles the corresponding mark in the wing of *P. tabaninus* Thunb., but is more sharply defined; the veins separating the second posterior marginal cell from the discal cell, and the fifth posterior marginal cell from the second basal cell are each enclosed in a sharply defined, cream-buff spot; a faint, elongate, cream-buff spot is visible on the sixth longitudinal vein, in the centre of the lower margin of the anal cell, and both basal cells are cream-buff at the base; veins sepia-coloured, except in the lighter areas where they are cinnamon-buff or pinkish-buff, first longitudinal vein where enclosed in more distal of the two dark costal areas, and fifth longitudinal vein except at base and tip of second basal cell, darker than most other veins or portions of veins. *Halteres* cinnamon-buff. *Legs*: hind femora slightly incrassate towards distal extremity; femora, front and middle tibiae, and last four segments of all tarsi russet, russet-brown, or chocolate-brown, hind tibiae blackish-brown, first segment of all tarsi bright mustard-yellow, narrowly russet-brown at extreme tip, last segment of all tarsi russet, paler than three preceding segments; claws russet-brown at base, then blackish-brown or black; pulvilli and empodia ochraceous-buff or ochraceous-tawny; femora, front and middle tibiae, and second and two following segments of all tarsi clothed mainly with russet-brown, dark-brown, or blackish-brown hair, first segment of all tarsi except extreme tip clothed with glistening Naples-yellow hair, inner and flexor surfaces of front tibiae, anterior and posterior surfaces of proximal portion of hind femora, and last segment and extreme tip of first segment of all tarsi clothed with russet-brown or chestnut-brown hair, hind tibiae fairly thickly clothed with blackish-brown or black hair, which, except hair on flexor surface of hind femora, is longer than hair on legs elsewhere.

Brazil: Villa Nova, R. Amazons (*H. W. Bates*).

The species described above, which is dedicated to the memory of its discoverer, the well-known author of 'The Naturalist on the River Amazons,' is readily distinguishable from any of its congeners included in the present paper. From *P. tabaninus* Thunb., in addition to the points of difference to which special attention has been shown in the foregoing description, *P. batesi* is separable, *inter alia*, owing to its unstriped thorax, and, at any rate in the ♂ sex, the silvery sheen on the dorsum of the abdomen. From the two following species, in both of which, at least in the ♂, the dorsum of the abdomen is likewise "silver-washed," *P. batesi* may be distinguished in the same sex, *inter alia*, by its abdomen being narrower and spotted with black along the lateral margins. From *P. hellerianus* Enderl., of which a re-description is given below, *P. batesi* is further distinguishable, owing to its much more clearly marked wings, to the presence of dark spots on the thorax, and to the surface of the latter not being silvery.

Pantophthalmus hellerianus, Enderl. (Text-fig. 3.)

Acanthomera helleriana Enderlein, Zool. Anz., Bd. xliv, no. 13, p. 581 (July 28, 1914).

Since the original description of this species, which is at present only known in the male sex, in some respects requires amplification, *P. hellerianus* Enderl. is redescribed below. In the case of the specimen in the National Collection, at any rate, the brown or greyish-brown, W-shaped mark on the dorsum of the thorax, on which Enderlein lays stress, is only visible when the insect is viewed at a fairly low angle from behind, and even then it is not very distinct.

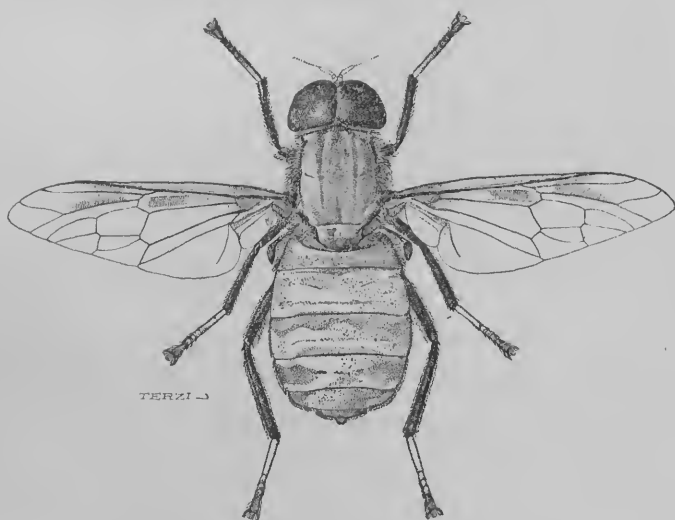
♂.—Length (one specimen) 29.5 mm.; width of head 8.4 mm.; greatest width of abdomen (across third tergite) 12.2 mm.; length of wing 23.2 mm.

Dorsal surface of both thorax and abdomen, at least in ♂, "washed" with silver, which on thorax is duller, but on abdomen has a more pronounced silken sheen; facial "beak" very small and inconspicuous; dorsum of thorax (scutum), when viewed from certain angles, with more or less distinct traces of longitudinal stripes; dorsum of abdomen unicolorous, without definite lateral spots, broad, flat, and somewhat ovate pyriform in outline when viewed from above, with sharp edges to third and following tergites; wings pale, with (except when viewed against a dark background) faint, ill-defined markings; hind legs with a small subfemoral spine.

Head in ♂ distinctly flattened in antero-posterior direction; upper portion of face, except immediately adjacent to bases of antennæ, isabella-coloured; remainder of face, including base of beak, as also jowls and basioccipital region, dark mummy-brown or blackish-brown, tip of beak, which scarcely protrudes beyond enveloping hood formed by base, chestnut-brown, shining; occiput cream-buff pollinose; jowls clothed with brownish or dark brown hair, with an ochraceous-tawny gleam at base, basioccipital region clothed with ochraceous-tawny hair; first and second segments of palpi greyish cinnamon-brown, clothed with dark brown hair, terminal segment tawny or cinnamon-rufous, curved, slender, and tapering; first segment of antennæ mummy-brown, second segment tawny, fringed below with minute, ochraceous-buff hairs (third segment missing in specimen described). Thorax: dorsum of main portion (scutum), when viewed at an angle from behind, exhibiting a pair of admedian, darker (shimmering greyish-olive), longitudinal stripes, commencing on fore border, converging and diminishing somewhat in width as they proceed backwards, and becoming narrower and indistinct after passing transverse suture; posterior portion of scutum with a similar, median, longitudinal stripe, commencing in prescutellar groove and tapering off and disappearing about halfway between latter and transverse suture; dorsum of scutum clothed with fine yellowish hair; scutellum, which, except on anterior angles, is

mainly sepia-coloured, clothed with similar hair; outer extremities of humeral calli cinnamon-rufous, shining, a ridge of fairly long, shining, tawny-olive or cinnamon-buff hair on each side of dorsum, connecting humeral with corresponding postalar callus, postalar calli mainly mummy-brown, clothed with similarly coloured hair; pleuræ and pectus mummy-brown, clothed with hair of similar colour, a tuft of bright ochraceous-tawny hair on each side, in prothoracic region. *Abdomen*: ground-colour of dorsum russet, lateral extremities of first tergite broadly, and those of fourth tergite narrowly sepia-coloured, anterior angles of second and third tergites similarly tinted; first tergite clothed with fine cinnamon-buff hair, longer and more conspicuous on lateral

Text-figure 3.

*Pantophthalmus hellerianus* Enderl., ♂. $\times 1\frac{1}{2}$.

extremities, where, except on anterior angles, it has an ochraceous-tawny tinge; lateral extremities of second tergite clothed with fine, short, appressed, cinnamon-buff hair (sepia-coloured area occupying each anterior angle clothed with shining cinnamon-brown hair); lateral extremities of third and two following tergites fringed with cinnamon-brown hair; sixth tergite largely clothed with similar hair, which is longer on hind border; venter uniformly tawny. *Wings* pale mouse-grey, first costal and sub-jacent cell mummy-brown or sepia-coloured, two dusky (dusky-drab), more or less quadrate blotches on costal border, separated by cream-buff interspaces; proximal blotch including rather less than distal half of first basal cell, but not extending to tip of latter; distal blotch, which in specimen described at least is the darker of the two, including distal sixth or seventh of first

longitudinal vein, and area immediately below as far as third longitudinal vein; tip of wing, including distal portion of first submarginal and entire second submarginal cell, except its extreme base, somewhat darker than hind border (when viewed against a light background), and separated from distal costal blotch by an ill-defined and irregular pale area; costa ochraceous-tawny or light cinnamon-brown (mummy-brown at base and above distal costal blotch), remaining veins cinnamon-brown, ochraceous-tawny or ochraceous-buff (in darker areas corresponding in tint to adjacent membrane). *Halteres*: stalks cinnamon-buff, knobs blackish brown. *Legs*: hind femora of uniform thickness (not incrassate towards distal extremity); femora and tibiæ russet-coloured, clothed with fine, dark brown hair, flexor surfaces of front tibiæ clothed with short, glistening, ochraceous-tawny hair; first segment of front and middle tarsi ochraceous-buff (cinnamon-brown at extreme tips on flexor surface), first segment of hind tarsi cream-buff (light cinnamon-brown at extreme tips on flexor surface), last four segments of all tarsi ochraceous-tawny, clothed with minute, appressed hairs of similar colour; claws rufous-tawny at base, then black; pulvilli and empodia ochraceous-buff.

One ♂, Brazil: R. Amazons (precise locality unknown) (*H. W. Bates*).

Pantophthalmus hellerianus, which, in the ♂ sex at any rate, agrees with *P. argyropastus* Big., in having the dorsal surface of the abdomen silvery, is readily distinguishable from that species, *inter alia*, by the dorsum of the main portion of the thorax being not only much paler but also devoid of dark spots (*cf.* notes on *P. argyropastus* below). For distinctions from *P. batesi* Austen, *vide supra*, p. 568.

Finally it may be added that the example of *P. hellerianus* in the National Collection exhibits, on the dorsal surface of its abdomen, several specimens of the pseudo-parasitic Acarid mentioned in the present paper in connection with *P. tabaninus* Thunb., and other species; in this case there is also a number of very much smaller mites on the dorsum of the thorax.

Pantophthalmus argyropastus Big.

Megalomyia argyropasta Bigot, Ann. Soc. Ent. Fr., 5^e Sér., T. x., Bulletin, p. v (1880).

Megalemyia argyropasta Bigot, Ann. Soc. Ent. Fr., 6^e Sér., T. i. pp. 455, 458 (1881).

An examination of the holotype male of this species, formerly in the Bigot collection and presented to the British Museum (Natural History) by Mr. J. E. Collin, F.E.S., shows that, in spite of Bigot's misleading statement to the effect that the thorax is marked with "three, somewhat indistinct, blackish bands," the dorsum of the main portion of the thorax (scutum) is actually unicolorous, with scarcely a trace of longitudinal stripes, but

spotted as in *P. batesi* Austen, that is to say, with a pair of small, blackish-brown, admedian spots on the transverse suture, a large seal-brown blotch in front of the scutellum, and the postalar calli similarly marked; the humeral calli are pale drab-grey pollinose above. The dorsum of the main portion of the thorax being dark brown, with a thin, smoke-grey, faintly silvery, pollinose covering, clothed with fine, cinnamon-buff or drab-coloured hair, the general appearance of this part of the body resembles that of moleskin. The dorsum of the abdomen, which is unicolorous and, when viewed at an angle from behind, appears dull Mars-brown, has a bright silvery sheen when regarded from other directions.

Pantophthalmus argyropastus is one of the smaller representatives of its genus, the type, which is from Panama, measuring only 24.5 mm. in length.

***Pantophthalmus versicolor*, sp. n. (Text-fig. 4.)**

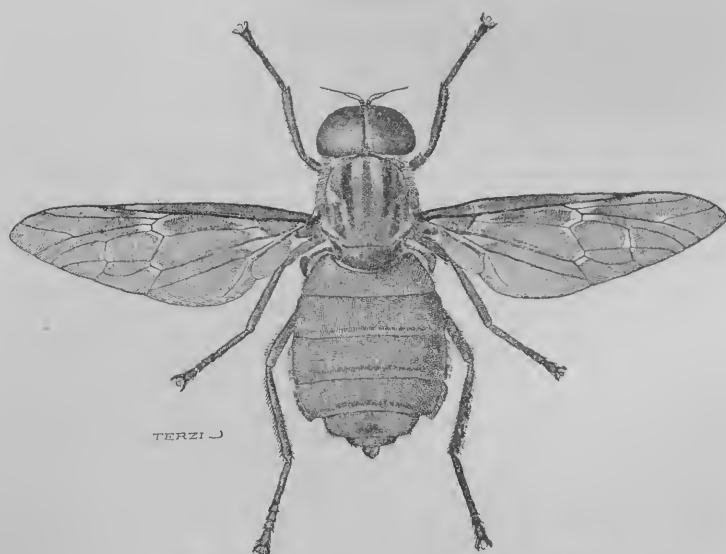
♂.—Length (three specimens) 27 to 30 mm.; width of head 7.75 to just over 8 mm.; greatest width of abdomen (across third tergite, exclusive of fringe of hair) 12.2 to 14.25 mm.; length of wing 22.25 to 24.6 mm.

Medium-sized species, with smallish head, which is distinctly flattened antero-posteriorly, striped thorax, and (at any rate in ♂) vivid ferruginous or orange-rufous, sharp-edged abdomen; facial tubercle or "beak" in ♂ either indistinguishable, its position marked by a pit, or minute and vestigial; abdominal tergites without lateral spots, though basal angles of first tergite extensively, and those of second tergite narrowly, mummy-brown; wing-markings in ♂ resembling those in same sex of P. tabaninus Thunb.; hind femora of uniform thickness, without a spine on under surface, and with terminal spine represented only by a blunt projection.

Head: face and jowls mummy-brown, a transverse, horizontal, smoke-grey, pollinose streak on front margin of jowls connecting each eye with buccal cavity; occiput greyish-olive, posterior orbits silvery-white pollinose; jowls clothed with mummy-brown hair, which is shining ferruginous at base; first and second segments of *palpi* clove-brown, clothed, like the terminal segment except distal extremity of latter, with brownish-ferruginous hair, terminal segment russet (brownish at base), cylindrical, straight, bluntly pointed at distal extremity; *antennæ* in ♂ lighter or darker cinnamon-brown (terminal style ochraceous-tawny), third (compound) segment viewed from side bluntly lanceolate in outline, second segment midway between base and distal extremity bearing a circlet of short, sparse, cinnamon-brown or ochraceous-tawny hairs. *Thorax*: ground-colour of dorsum of scutum mummy-brown or olive-brown; dorsum smoke-grey or pale smoke-grey pollinose in front, on humeral calli, lateral margins, lateral expansions of transverse suture, and on postalar calli; central region of dorsum bearing three conspicuous, dark, converging, longitudinal stripes (approximately equal in

breadth, except that outer stripes are usually somewhat broader in front), extending from front to hind margin. but confluent posteriorly after passing transverse suture, outer stripes black or blackish-brown, median stripe paler, dark mummy-brown, sometimes less noticeable than outer stripes; behind transverse suture a short blackish-brown or dark brown longitudinal stripe on each side, extending from suture to postalar callus, and on inner side of this stripe a somewhat oblique, shining, chestnut-brown stripe; dorsum, except main portion of upper surface of scutellum, which is bare, thickly clothed with fine, silky, glistening, reddish-brown, ochraceous-tawny or tawny-olive hair, which on lateral borders is longer than elsewhere; scutellum mummy-brown, dark seal-brown, or russet-brown, more or less distinctly shimmering silvery-white

Text-figure 4.

*Pantophthalmus versicolor* Austen, ♂. $\times 1\frac{1}{2}$.

or shimmering smoke-grey pollinose above, except on hind border; pleuræ and pectus chocolate-brown or warm sepia-coloured, clothed with fine and fairly long, dark brown or reddish-brown hair. *Abdomen*: second and two following tergites each with a reddish-brown transverse band, just in front of hind margin and widely separated from lateral extremities in each case, posterior half of fifth tergite with an ill-defined blotch of similar colour in centre, not reaching hind margin; first tergite thinly clothed with fine hair, which is ochreous and recumbent except on basal angles where it is brownish and erect; second and three following tergites sparsely clothed with minute, appressed, glistening, ochraceous-tawny hairs, which in the case of second and

third tergites at any rate are only noticeable on close scrutiny, sixth tergite clothed with longer hair of similar colour; lateral extremities of second tergite, except posterior angles, clothed with dark brown or brownish hair, those of third and fourth tergites fringed with longer, outstanding, closely set, shining, cinnamon-rufous or russet-tawny hair, lateral extremities of fifth tergite with a shorter, thinner, and paler fringe of similar character; first sternite mummy-brown or sepia-coloured (hind border smoke-grey or drab-grey pollinose), clothed with fine and fairly long, erect, dark brown hair; remaining sternites sepia-coloured, lateral extremities of third and following sternites paler (ochraceous-tawny); second and two following sternites (except lateral extremities of third and fourth), and central portion of fifth sternite thinly clothed with fine, dark brown hair, which on second sternite, at least anteriorly, is longer and erect, but elsewhere is shorter and appressed; sixth sternite, and lateral extremities of the two preceding sternites, clothed with russet-tawny hair; membrane connecting sternites with corresponding tergites longitudinally wrinkled, dark brown in case of first segment, and in case of succeeding segments dark brown in front and ochraceous-tawny behind. *Wings* sepia-coloured, with pale (cream-buff) markings as shown in text-fig. 4, these markings occupying corresponding positions to those in wing of *P. tabaninus* Thunb., but somewhat more restricted in extent; darkest areas in wing are those which are usual in this family, namely first costal cell and cell immediately below, second costal cell except its distal extremity, first basal cell except its base and tip, and a smaller and somewhat ill-defined area including stigmatic region, extending from costa to distal half or three-fourths of discal cell, with an outward extension along third longitudinal vein; veins for most part ferruginous or mummy-brown, paler in pale areas. *Squamæ* blackish-brown, fringed with similarly coloured hair, and also with a tuft of shining tawny or russet hair. *Halteres*: stalks ochraceous-buff or ochraceous-tawny, knobs mummy-brown. *Legs* uniformly russet or chestnut-brown, tarsi sometimes paler (cinnamon-rufous); legs clothed with glistening hair of similar colour, long and fine on front and hind femora short elsewhere, hair on femora sometimes appearing dark brown, sometimes tawny; claws orange-cinnamon or russet, their distal extremities black; pulvilli and empodia ochraceous-buff or orange-buff.

Guatemala and Mexico. Holotype, Pancina, Vera Paz, Guatemala (*G. C. Champion*); two paratypes, Cuesta de Misantla, Mexico (*M. Trujillo*). The holotype is the specimen briefly described, but not named, by Osten Sacken (*Biol. Centr.-Amer.*, Dipt. i. p. 68).

Through the kindness of Mr. J. E. Collin, the British Museum (Natural History) has received a solitary ♂ of this species, which unfortunately is in poor condition and is without a locality label. In the Bigot collection, whence it was taken, this fly was

associated with two ♂♂ of *P. tabaninus* Thunb. and all three specimens stood above the label "*Acanthomera seticornis* Wied. ♂," in Macquart's handwriting (*vide supra*, p. 563).

In the male sex, at any rate, *Pantophthalmus versicolor*, by means of the characters mentioned in the diagnosis printed in italics above, is readily distinguishable from any of its congeners at present known. From the male of *P. tabaninus* Thunb., for which at the first glance it might possibly be mistaken, the male of the present species can be distinguished at once owing to its smaller and differently shaped head, duskier and differently striped thorax, and broader and flatter, sharp-edged abdomen, the sides of which are devoid of white spots, and are not black on the basal half.

Pantophthalmus pictus Wied.

Acanthomera picta Wiedemann, Diptera Exotica, p. 61, Tab. ii. fig. 2 (1821).

Acanthomera flavipes Macquart, Mém. Soc. roy. des Sc., de l'Agric. et des Arts de Lille, Année 1846, p. 42, Tab. i. fig. 2 (1847). [New synonym.]

Acanthomera magnifica Walker, Ins. Sandl., Diptera, Part i. p. 74, pl. 1. fig. 1 (1850). [New synonym.]

Acanthomera teret truncum Fiebrig, Zeitschr. f. wiss. Insektenbiol., Bd. ii. pp. 345-347, figs. 17-19 (1906).

Of this species, which is the genotype of *Acanthomera* Wied., the British Museum (Natural History) possesses a ♂ from an unknown locality in Brazil (purchased from — Argent, 1847); a ♀ (the holotype of *Acanthomera magnifica* Walk.), from "South America" (*ex coll.* W. W. Saunders); and a second ♀, taken at Sapucay, Paraguay, 21.i.1905 (*W. Foster*). The type of *Acanthomera magnifica* Walk. represents a form of the species in which the dorsum of the abdomen is for the most part ferruginous, tawny, or orange-cinnamon instead of black, the latter colour being confined to the base (first visible tergite, except its hind border), ovipositor, and a blotch at each lateral extremity of the second to the fourth tergites inclusive. In the case of the type of *A. magnifica*, moreover, the whitish transverse streak near each posterior angle of the third ventral scute is wanting, but this is doubtless due to individual variation.

From the Bigot collection, thanks to the generosity of Mr. J. E. Collin, the National series has been enriched by the type of *Acanthomera flavipes* Macq. (stated by Macquart—*loc. cit.*—to be from Brazil), and two other ♀♀, all of which unfortunately are without locality labels. In the case of Macquart's type the abdomen is russet-brown ("brun vineux," *apud* Macquart, *loc. cit.*), a fact which misled Enderlein (Zool. Anz., Bd. xli. p. 101 (1912)) into treating *A. flavipes* Macq. as specifically distinct from *A. picta* Wied. Enderlein, however (*l. cit.* p. 105), is perfectly correct in regarding *A. teret truncum* Fiebrig as a synonym of

A. picta Wied., and indeed, so long ago as 1908, the present writer placed a manuscript note in the Museum collection drawing attention to this identity.

The species under discussion is represented in the Hope Department of the Oxford University Museum by two ♀♀, one of which is of ordinary size (total length, including ovipositor and facial beak, 41.2 mm.; wing-expanse 73 mm.), while the other is a diminutive example, with dimensions (total length, including ovipositor and facial beak, 29 mm.: wing-expanse 50.5 mm.) much below normal. Both specimens are unfortunately without locality labels; the larger of the two is labelled "Miers coll.," while the other, probably collected by Bates on the Amazons, bears a label in Westwood's handwriting, with the words "E Mus. Saunders. 1867."

In the wing-marking of *Pantophthalmus pictus* a characteristic feature is a broad, dark brown, L-shaped blotch, the shorter arm of which meets the costa in such a way as to include the tip of the mediastinal vein, while the longer arm embraces the third longitudinal vein between the anterior transverse vein and the bifurcation of the former, without being in contact with either.

Fiebrig's interesting observations on the preliminary stages and bionomics of "*A. teretruncum*" have already been referred to (*vide supra*, p. 556).

Pantophthalmus chuni Enderl.

Acanthomera chuni Enderlein, Zool. Anz., Bd. xli. no. 3, pp. 102, 103, fig. 4 (December 20, 1912).

This fine species—described by its author from two ♀♀ from Peru, in the Zoological Museum, Stettin—is represented in the National Collection by a single ♀ from Brazil (R. Amazons—precise locality unknown: *H. W. Bates*), measuring 42 mm. in length from the tip of the prominent facial beak to the end of the ovipositor, and having a wing-expanse of 70.6 mm. On the second and third abdominal tergites, conspicuous against the velvety-black or sooty-black ground-colour, are half-a-dozen specimens of the Acarid parasite already noticed in connection with several other species.

By the courtesy of Dr. Hugh Scott, the writer has been permitted to examine a ♀ of this species in the University Museum of Zoology, Cambridge. Except that its dimensions (length from tip of facial beak to end of ovipositor 29 mm., wing-expanse 53.75 mm.) are much below normal, this example, which was likewise taken on the River Amazons (*Nevile Goodman*, 1879), agrees with that already mentioned.

In spite of certain apparent discrepancies, there can be no doubt as to the correctness of the identification of the Brazilian specimens referred to above. The description of *P. (Acanthomera) chuni* furnished by Enderlein is seriously misleading in more than one respect. In the first place the German author speaks of the

face as being "very broad and very greatly widened in front"; a comparison, however, of the British Museum specimen with examples of other species shows that the ♀ of *P. chuni* is in no way abnormal in this respect. Secondly, both in the diagnostic table on p. 102 (*loc. cit.*) and in the detailed description on the following page, Enderlein speaks of a *single, relatively narrow* thoracic stripe. On the other hand, in actual fact, not only does the dorsum of the thorax exhibit the *three* dark thoracic stripes so constantly seen in representatives of the family Pantophthalmidae, but, even regarding the thoracic markings as consisting of a single stripe, bearing on its surface a pair of paler, admedian stripes, the measurements given by Enderlein himself, which agree in detail with the corresponding measurements taken from the British Museum specimen, show that as a characterization "relatively narrow" is entirely unwarranted.

Pantophthalmus conspicabilis, sp. n. (Text-fig. 5.)

♀.—Length (one specimen), including ovipositor and facial beak, 42 mm.; width of head 10·5 mm.; width of front at vertex 1·8 mm. (immediately above base of antennæ just under 2 mm.); length of facial beak just under 3 mm.; greatest width of abdomen (across third tergite) just under 16 mm.; length of wing 31·5 mm.

In ♀ sex, at least as represented by typical specimen, a grey and black species, with prominent, sharp-pointed facial beak; almost parallel-sided front; conspicuously striped thorax; blunt-edged abdomen, which on dorsal surface, on each lateral border, bears two conspicuous silvery-white spots and a fringe of short hair; wings marbled with sepia and light buff, somewhat resembling those of Pantophthalmus (Acanthomera) chuni Enderl., but differing in details of pattern; and with hind femora incrassate towards tips, and bearing a small spine on under surface and a large terminal spine.

Head: face and jowls sepia-coloured or mummy-brown, inner margin of each eye bounding face with a narrow, smoke-grey, pollinose edging, which above sends off an extension to meet base of facial beak, while below a similar but silvery-grey extension connects pollinose edging of eye with buccal cavity; facial beak long and sharp-pointed, its expanded basal portion dark brown above, russet-brown on sides below, the shining tip blackish-brown; front (frons) of moderate width, and only very slightly broader at its anterior extremity than at vertex; front and occiput, including posterior orbits, uniformly olive-buff or pale olive-buff pollinose, except that the conspicuous ocellar tubercle, which is distinctly separated from vertical margin of occiput, is mummy-brown, and that in certain aspects, at least in typical specimen, behind ocellar tubercle, on vertical margin of occiput, and also on central anterior portion of front, above base of antennæ, ground-colour shows through pollinose

covering, and appears more or less tawny or ochraceous-salmon-coloured; upper portion of occiput, except posterior orbits, clothed with fine, ochraceous-huff hair, basioccipital region and lower portion of occiput, except posterior orbits, clothed, like jowls, with fine, brownish or dark brown hair; first and second segments of *palpi* dull tawny-olive (second segment dark brown shortly before distal extremity), clothed on sides and below with blackish hair which is longer towards tip of second segment, distal segment russet-coloured with a thin greyish-pollinose covering, cylindrical and acuminate, considerably thicker than base of proximal segment, but less swollen than is typically the case in the genus *Rhaphiorhynchus*, distal segment at base and on outer surface bearing a few short black hairs; *antennae* in ♀ 5.6 mm. in length in case of type, agreeing generally in shape, and in form and relative dimensions of the eight divisions of the third (compound) segment, with antenna of *Pantophthalmus* (*Acanthomera*) *chuni* Enderl., ♀, as figured (Zool. Anz., Bd. xli. no. 3, p. 104, fig. 4, December 20, 1912) by its author; first and second segments of antennae mummy-brown, distal extremity of second segment sparsely fringed with short, ochreous hairs, proximal division of third segment mummy-brown, next six divisions tawny, terminal (elongate and attenuate) division paler (pinkish-cinnamon), entire antennae, when viewed from certain angles, clothed with a thin, silvery-grey, pollinose covering. *Thorax*: dorsum of main portion (scutum) silvery-grey (a deep border on each side, extending from humeral to postalar calli inclusive, silvery), median area in front of transverse suture when viewed from certain angles tinged with pinkish-cinnamon (at least in case of type), owing to ground-colour showing through; from inner end of each humeral callus a conspicuous, blackish-brown longitudinal stripe extends backwards, each stripe being fairly broad in front and diminishing in width as it passes back, until at a point about one-third of the distance between transverse suture and prescutellar groove it becomes suddenly attenuate, and is thence continued as a narrow extension as far as the prescutellar groove, in front of which it is connected with its fellow; attenuate portion of blackish-brown longitudinal stripes scarcely noticeable from certain angles, and completely visible only when insect is viewed at a low angle from behind; in middle line, between the two blackish-brown stripes, is an incomplete, paler (brownish-drab) longitudinal stripe, which, commencing as a deltoid expansion resting upon posterior commissure between the attenuate ends of the blackish-brown stripes, extends forwards, disappearing (in case of type, at least) before reaching transverse suture, but reappearing on level of latter, and tapering to a point and terminating between humeral calli; on upper margin of lateral silvery border on each side, between inner extremities of humeral and postalar calli, is a narrow, longitudinal brownish streak, which, following configuration of thorax, curves outwards in front of transverse suture, and makes

a similar but rather flatter curve behind it; scutellum mummy-brown (posterior border, which is thickly covered with small, polished, rounded tubercles, mainly blackish-brown), lateral extremities of dorsal surface silvery-grey; dorsum of scutum clothed with fine, short, silky, yellowish or brownish hair, which becomes longer on hind border; scutellum, except anterior half of dorsal surface, which is bare, clothed with short, dark brown or blackish-brown hair; pleuræ and pectus mummy-brown (appearing darker when viewed from certain angles), clothed with fine, dark brown hair. *Abdomen* (at least in case of type, and except as regards the lateral silvery-white spots) uniformly blackish-brown or brownish-black above and below (ventral surface perhaps rather more brownish than dorsal); second and

Text-figure 5.



Pantophthalmus conspicabilis Austen, ♀. $\times 1\frac{1}{2}$.

third tergites each with a conspicuous, silvery-white spot on each side, close to posterior angle; lateral borders of dorsum clothed with blackish-brown hair, which on second and two following tergites forms a not very conspicuous fringe on each side (on lateral margins of fourth tergite the fringe is longer and sparser than on the two preceding tergites); first sternite, and central area of second, clothed with fine, dark brownish hair. *Wings* marked as shown in text-fig. 5, the dark blotches on costal border sharply defined and conspicuous; veins sepia-coloured or cinnamon-brown, in pale areas usually paler (pinkish-cinnamon). *Halteres*: stalks cinnamon-brown, knobs blackish-brown. *Legs*: front femora with a small but distinct terminal spine, which on

middle femora is represented by a blunt triangular projection; hind legs with a very small, somewhat blunt and triangular, sub-femoral spine; terminal spine on hind femora large, long (1 mm. in length) and sharp; length of hind femur (exclusive of terminal spine) 15.6 mm.; hind femora distinctly thickened towards distal extremity, clothed with fine, short, blackish hair, which is longer on flexor surface and, owing to greater density, especially noticeable between subfemoral spine and tip, distal extremities of extensor and posterior surfaces clothed mainly with bright, appressed, russet-coloured hair; hind tibiæ thickly clothed with fine, black hair, longer than elsewhere on extensor surface, where it forms a conspicuous fringe; femora reddish-brown, darker towards distal extremities, tips of hind pair reddish-brown; front tibiæ russet-coloured, clothed on flexor surface with short, glistening, ochraceous-tawny hair; middle tibiæ russet-brown, clothed for most part with dark brown hairs; hind tibiæ black; first segment of tarsi buff-yellow, extreme tip brown; remaining segments of front tarsi sepia-coloured, second segment, except distal third, and extreme bases of following segments cinnamon-buff, last three segments of front tarsi clothed above with dark brown hairs, tip of last segment and distal angles of preceding segments clothed with bright ochraceous-tawny hairs; second segment of middle tarsi cinnamon-brown, darker at distal extremity, last three segments of middle tarsi dark brown, clothed above with similarly coloured hair, tip of last segment clothed with tawny hair; last four segments of hind tarsi blackish-brown, second segment paler at base; claws orange-cinnamon or russet, their tips black; pulvilli and empodia ochraceous-tawny.

Colombia (— *Chevrolat*): *ex coll.* W. W. Saunders.

In the ♀ sex, at any rate, the handsome species described above, although at the first glance presenting a certain superficial resemblance to *Pantophthalmus* (*Acanthomera*) *chuni* Enderl. (*vide supra*), is distinguishable *inter alia* owing to the pallor of the front (frons) and of the dorsum of the thorax; the reduction in the striping of the latter as regards the median longitudinal stripe and the distal extremities of the paired dark stripes; and the shorter, much more densely hairy and consequently apparently stouter hind tibiæ. In the case of the type, at least, of *P. conspicabilis*, as compared with the specimen of *P. chuni* referred to on p. 576, the lateral silvery-white spots on the dorsum of the abdomen are blunter and rounder.

This species is in any case closely allied to, and may ultimately prove to be identical with, *Pantophthalmus kertészianus* (*Acanthomera kertésziana*) Enderlein, described (Zool. Anz., Bd. xlv. no. 13, p. 578, July 28, 1914) from two ♀ ♀ from Peru, in the Museums of Budapest and Stettin. Since, however, Enderlein (*l. cit.* p. 579), in describing the wing in *P. kertészianus*, says that the "basal fourth and a large spot on the anterior margin" are "pale ochreous," it seems wiser, provisionally at any rate, to regard *P. conspicabilis* as distinct.

Pantophthalmus conspicuus, sp. n. (Text-figs. 6, 7.)

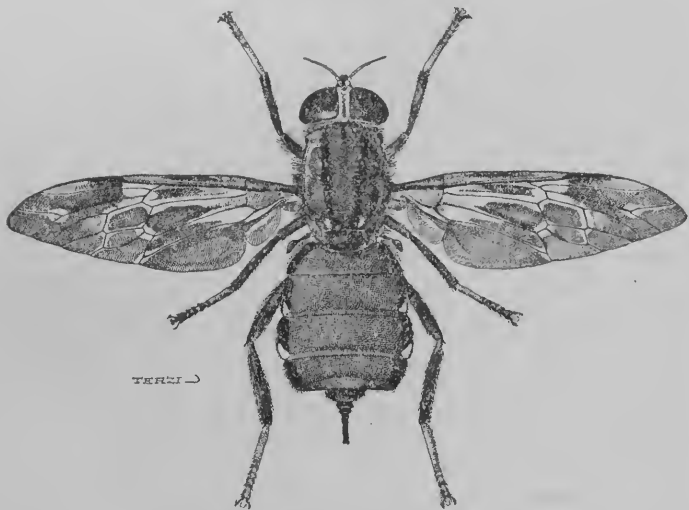
♀.—Length (one specimen), including ovipositor and facial beak, 36.2 mm.; width of head 9.4 mm.; width of front at vertex 1.8 mm.; greatest width of abdomen (across third tergite) 14.5 mm.; length of wing 28 mm.

In ♀ sex, at least in case of typical specimen, a grey, honey-yellow or isabella-coloured (probably in life green) and black species, with facial beak represented by a blunt, rounded prominence, conspicuously black-striped thorax, blunt-edged abdomen, and no subfemoral spine on hind legs; lateral borders of first four abdominal tergites black, with two large, silvery-white spots on each side; wings marked as shown in text-fig. 6, broadly cream-buff or buff-yellow at base; hind femora somewhat incrassate towards tips, hind tibiæ thickly clothed with black hair, appearing stout.

Head: front (frons) light greyish-olive pollinose, of moderate and uniform width, ocellar tubercle black; face and jowls mummy-brown, tip of bluntly rounded facial beak reddish, inner and lower orbits bordering face and jowls narrowly olive-buff pollinose, jowls and basioccipital region clothed with dark brown or blackish-brown hair; occiput dark olive-buff pollinose, appearing buffy-brown in certain areas and mummy-brown below vertex, clothed with fine, brownish hair, which has an ochraceous-tawny or cinnamon-brown sheen, posterior orbits light buff pollinose, bare; first and second segments of *palpi* sepia-coloured, together shorter than distal segment and clothed with dark brown or blackish-brown hair, distal segment russet-coloured, cylindrical, tapering somewhat towards tip and ending bluntly, with a few blackish hairs on inner side towards base; *antennæ* thinly olive-buff or smoke-grey pollinose, first and second segments, tawny, distal extremity of second segment fringed with bright ochraceous-tawny hairs, third (compound) segment russet-brown, terminal division paler (cinnamon- or pinkish-cinnamon-coloured). *Thorax*: dorsum of main portion (scutum) pale smoke-grey pollinose (ground-colour largely chestnut-brown or russet, ground-colour of humeral calli pinkish-buff), with two straight and complete, converging, longitudinal black stripes of uniform width, which in front are in contact with inner ends of humeral calli, and posteriorly meet together in prescutellar groove; in middle line a brownish, dusky stripe (visible at least when insect is regarded at an angle of 45° from behind), commencing on front margin as an elongate black spot, extends backwards and becomes indistinct shortly after passing level of transverse suture; scutellum, except lateral extremities, which are whitish-grey pollinose and clothed with pale hair, blackish-brown, clothed above with short blackish hair, and below with brownish hair; dorsum of scutum clothed in front with short yellowish hair, and posteriorly with short blackish or black hair, on each side above pleuræ and in front of transverse suture an area of longer, dark brown or brownish hair, posteriorly ochraceous-tawny at base;

pleuræ and upper border of pectus black, clothed with black or blackish hair, central area of pectus light greyish-olive pollinose (ground-colour chestnut-brown), clothed with fine, cinnamon-buff-coloured hair. *Abdomen*; first four tergites, at least in case of type, honey-yellow or isabella-coloured, here and there irregularly mottled with dark green or greyish-olive, their lateral extremities black, fifth tergite dark olive, rather less than posterior half of preceding tergite similarly coloured in centre, second and third tergites each with a large, bluntly triangular, silvery-white spot in each posterior angle, not quite reaching hind margin in either case, first tergite with a pair of very small whitish spots in corresponding position but further from hind margin, ovipositor black or blackish-brown (distal extremity cinnamon-coloured);

Text-figure 6.

*Pantophthalmus conspicuus* Austen, ♀. $\times 1\frac{1}{2}$.

lateral borders of first four tergites, except silvery-white spots, clothed with fine, short, black hair, which, though longer on outer edges, does not form a conspicuous fringe; first four tergites, except lateral extremities, sparsely clothed with short, or minute and inconspicuous, ochraceous-buff or ochraceous-orange hairs; first four sternites clove-brown (their lateral extremities blackish-brown), with a shimmering, smoke-grey, pollinose covering and sparsely clothed with short, ochraceous-orange hairs, ventral surface of projecting lateral extremities of first four tergites black, fifth sternite blackish-brown, sparsely clothed with similarly coloured hair, coloration of ventral surface of ovipositor same as that of dorsal. *Wings*: infuscated (blackish-brown) area chiefly confined to distal third and posterior two-thirds, but first

basal cell with an elongate dusky blotch occupying part of its distal two-thirds, but not extending either to tip or to hind border of the cell, an elongate brownish streak in second costal cell above foregoing blotch, a large pale spot on fork of third longitudinal vein, and a more or less distinct pale streak along costa at tip of marginal cell; infuscated area in discal cell not in contact with boundaries of cell at any point except on anterior basal transverse vein, across centre of which it is connected with large infuscated area in second basal cell, which again is continuous with infuscated axillary cell and alula, through infuscation occupying greater part of anal cell; veins mummy-brown or cinnamon-brown. *Halteres*: stalks tawny-olive, knobs dusky dull green or dusky olive-green. *Legs*: coxæ and trochanters tawny or russet-coloured, clothed mainly with tawny or ochreous hairs, front coxæ on outer side blackish and clothed with similarly coloured hair; front and middle femora with a bluntly triangular projection at distal extremity, terminal spine on hind femora not unusually large; front and middle femora chestnut-brown, with an ill-defined dark brown band before distal extremity, hind femora similarly coloured but darker, femora clothed mainly with dark brown or blackish hair, front and middle femora sparsely clothed at base on under side with short tawny hair, tips of all femora, at least above, and base of hind femora, clothed with glistening cinnamon-rufous hair, particularly noticeable at tips of hind femora on extensor surface, where it is short and closely appressed; front tibiæ russet, clothed largely with short, glistening tawny or cinnamon-rufous hairs, with longer and sparser dark brown hairs on extensor surface, middle tibiæ chestnut-brown (darker on anterior surface), extensor surface sparsely clothed with dark brown hair, flexor surface and tips, which are paler, clothed with short, glistening, appressed, cinnamon-rufous hair; hind tibiæ black (extreme tips paler and clothed with ochraceous-tawny hair); first three segments of front and middle tarsi, except tips, ochraceous-buff, last two segments and tips of preceding segments cinnamon-brown; front and middle tarsi entirely clothed with glistening, appressed, ochraceous-tawny hairs, longer at distal extremity of upper surface of terminal segment, minute or short elsewhere; first segment of hind tarsi warm buff or cinnamon-buff (extreme tip faintly cinnamon-brown), clothed with short, glistening, appressed, cream-buff hair; last four segments of hind tarsi cinnamon-brown, clothed (as also extreme tip of first segment) with glistening, appressed, ochraceous-tawny hairs; claws tawny or russet-coloured, their tips black; pulvilli and empodia ochraceous-tawny.

British Honduras: Corozal, 26. ix. 1922, "came to light, at night" (*Dr. F. L. Davis*). The collector of the type, who has been kind enough to present the specimen to the National Collection, writes that, although resident in British Honduras for very many years, he cannot remember having met with this species previously.

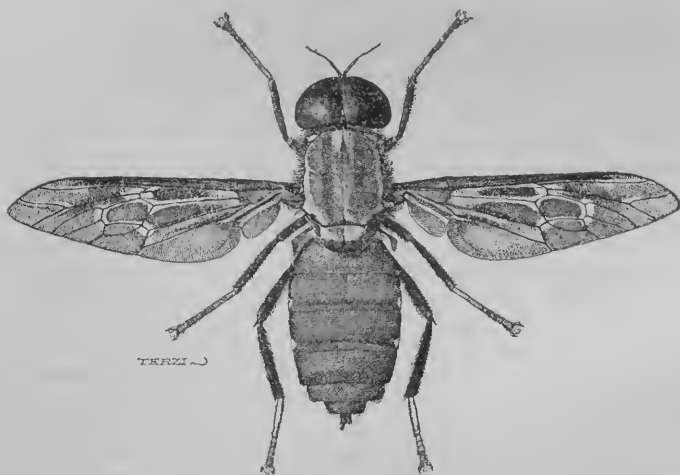
Apart from the coloration of the abdomen, as exhibited in the case of the typical specimen at least, *Pantophthalmus conspicuus* in the ♀ sex exhibits a certain superficial resemblance both to *P. chuni* Enderl. and *P. conspicabilis* Austen. From both of these species it is, however, distinguishable *inter alia* owing to the wings being broadly pale (creann-buff or buff-yellow) at the base, and to the facial beak being bluntly rounded at the tip instead of acuminate. From *P. chuni*, apart from any other characters, it is further distinguished by its stout, furry hind tibiae, and pale front (frons).

The type of *P. conspicuus* was originally preserved and sent to the Museum in spirit, and there is reason to believe that, owing either to this, or to natural *post-mortem* changes, the coloration of the disc of the abdomen (exclusive of the lateral borders) has suffered alteration, and that it was originally green. This at any rate seems a natural deduction from the fact that traces of green are visible here and there in the first four abdominal tergites, and that the halteres are still more or less green (*vide* description above). In any case, this is not the only instance in which a representative of this family is more or less green in life, since, according to the late Prof. Hermann (Deutsch. Ent. Z., Jahrg. 1916, Heft i. pp. 43, 45, April 1, 1916), the Brazilian *Pantophthalmus alienus* Herm., in the female sex at any rate, in which the ground-colour of the abdomen is dull velvety-black, has the hind margins of the first four tergites apple-green, while there are indications that in life the scutellum and halteres are of the same colour. It is of course well known that in those instances among Diptera—highly exceptional if the Chironomidae be excluded—in which the predominant colour in life is green, the green pigment after death is often or usually, largely or entirely, replaced by yellow. As cases in point, it will suffice to mention *Oxycera trilineata* Fabr., and other Stratiomyidae, such as the South American *Odontomyia pulchra* Wied.; *Tabanus fasciatus* Fabr., of West and Central Africa; and the European *Didea alneti* Flh.

What is almost certainly the male sex of *P. conspicuus* is represented by a solitary ♂ (*cf.* text-fig. 7) from the R. Amazons, Brazil (*H. W. Bates*), in the Hope Department, University Museum, Oxford (*ex coll.* W. W. Saunders). The dimensions of this specimen are as follows:—Length 29.6 mm.; width of head just over 8 mm.; greatest width of abdomen (across hind margin of second tergite) 9.4 mm.; length of wing 24.4 mm. Viewed from above and slightly from in front, the dorsum of the thorax, except the hind border of the scutellum, is unstriped and uniformly silvery, forming a striking colour-contrast with the dorsum of the abdomen, which is ochraceous-tawny; the lateral extremities of the first four abdominal tergites are black and deflexed, while the posterior angles of the second and third tergites are each occupied by a large, bluntly triangular, silvery-white spot, lateral borders and spots being scarcely noticeable

from above. The other principal external characters are as follows:—*Head*: frontal and vertical triangles smoke-grey pollinose, ocellar tubercle dark brown; face and jowls sepia-coloured, jowls clothed with hair of similar hue, inner orbits bordering face narrowly pinkish-buff pollinose; facial beak represented by a low, elongate oval, tawny-brown area, which is scarcely noticeable; occiput shimmering golden-ochraceous-buff pollinose, with darker reflections, and clothed with fine yellowish hair; *palpi* similar in colour to those of ♀, but distal segment considerably (about one-third) shorter than second; *antennæ* sepia-coloured, style paler, third (compound) segment cuneate, flattened from side to side, and deepest (in a dorso-ventral direction) at about one-fourth of its length from the base. *Thorax*: rather less than

Text-figure 7.



Presumptive ♂ of *Pantophthalmus conspicuus* Austen. $\times 1\frac{1}{2}$. (From a specimen in the Hope Department, University Museum, Oxford).

posterior half of scutellum blackish-brown, clothed with brownish hair, dividing line between infuscated and silvery areas straight; dorsum of scutum, except lateral borders immediately above pleuræ, clothed with fine, short, reflexed, whitish hair, lateral borders clothed with longer hair, light ochraceous buff in front of, and yellowish behind transverse suture, under side of postalar calli blackish-brown; viewed at a slight angle from behind, dorsum of scutum shows unpigmented longitudinal stripes, corresponding to the paired black stripes and commencement of a median stripe exhibited by the ♀; pleuræ and lateral borders of pectus dark clove-brown or blackish-brown, clothed with similarly coloured hair, remainder of pectus light ochraceous-buff, clothed with fine, silky hair of similar colour. *Abdomen*:

venter ochraceous-buff, pinkish-buff pollinose, sparsely clothed with fine, glistening ochreous hairs, lateral extremities of sternites brownish; dorsum, except lateral borders of first four segments, clothed with ochreous or ochraceous-buff hairs, for most part minute and inconspicuous except on first and sixth segments, lateral borders of first four tergites, except silvery-white spots, clothed with black or blackish hair. *Wings* (cp. text-figs. 6 & 7) with markings corresponding extremely closely to those exhibited by ♀, but tips paler. *Halteres* cinnamon-buff. *Legs* agreeing in all essential respects with those of ♀; coloration of hind coxæ and their hairy covering as in case of adjacent area of pectus.

Pantophthalmus vittatus Wied.

Acanthomera vittata Wiedemann, Auss. zweifl. Ins. i. p. 109 (1828).

Acanthomera fulvida Bigot, Ann. Soc. Ent. Fr., 5^e Sér., T. x., Bulletin, p. v (1880). [New synonym.]

A note in the National Collection in the handwriting of the late Baron C. R. Osten Sacken, and bearing the initials "O. S.," confirms the correctness of the identification of *P. vittatus* (*Acanthomera vittata*) Wied. as given above.

The following are the specimens of this species in the British Museum: a ♂, from the R. Amazons, Brazil (*H. W. Bates*); a ♀, also from Brazil, but exact provenance unknown, taken prior to 1849 (*Mrs. Noel*); and two ♀ ♀ (the type and paratype of *Acanthomera fulvida* Big.), from Guiana (*ex coll. J. Bigot*: presented by J. E. Collin, F.E.S.).

The two latter examples represent a form of *P. vittatus* in which the dark lateral spots on the dorsum of the abdomen are equally well developed in both sexes. Bigot himself (*loc. cit.*) mentions only a single specimen, but, since the alternative measurements given by this author agree with the respective lengths of the ♀ ♀ referred to, his remark "*Specimen unicum*" is probably a *lapsus calami*.

There are six specimens of *P. vittatus*—all ♀ ♀—in the Hope Department of the University Museum, Oxford. Of these, three are simply labelled "Miers coll.," and bear no further indication of provenance; of the remainder, one has a label with the words "S. S. Saunders, Bahia, Bz.,"; another is labelled "E. Mus. Saunders, 1867"; and a label attached to the sixth example shows that this specimen was taken in Brazil, and purchased from Higgins in 1871. Considerable variation in size is noticeable in the Oxford series; while the dimensions of the largest ♀ (total length, including ovipositor and short facial beak, 32.25 mm.; wing-expanse 57 mm.) are approximately the same as those of Mrs. Noel's specimen in the National Collection, the corresponding measurements of the smallest example in the possession of the Hope Department are 24.6 mm. and 40 mm. respectively—practically the same as those of the smaller of the

two ♀♀ from the Bigot collection, presented to the British Museum by Mr. Collin.

The ♂ and ♀ in the British Museum, collected respectively by H. W. Bates and Mrs. Noel, are each pseudo-parasitized by nymphs of the usual species of Gamasil mite. In the case of the ♂, there is only a single Acarid, which is on the upper surface of the abdomen; the pseudo-parasites on the ♀ are present on both sides of the abdomen, and, although only in small numbers, are more plentiful above than below. One of the specimens in the Oxford collection is similarly infested.

Pantophthalmus bellardii Bell.

Acanthomera bellardii Bellardi, Saggio di Ditterol. Messicana, Appendice, p. 16, Tav. iii. fig. 11 (1862).

Acanthomera championi Osten Sacken, Biol. Centr.-Amer., Diptera, vol. i. p. 67, Tab. iii. fig. 16 (1886). [New synonym.]

Pantophthalmus helleri Enderlein, Zool. Anz., Bd. xli. no. 3, pp. 108, 110, figs. 8, 9 (Dec. 20, 1912).

Although nothing can be said with reference to the male of *P. bellardii*, since it is at present unknown, in the female sex, as shown by the extensive series of specimens available to the writer for comparison, the species is normally one of the finest of its family, and is conspicuous, even among the huge Diptera with which this paper is concerned, as much on account of the dark coloration of the body and wings, as by reason of the shape of its shining abdomen. While females of *P. bellardii* of ordinary size are certainly not larger—perhaps if anything actually less bulky—than corresponding examples of *P. tabaninus* Thunb., the great breadth often exhibited by the flat abdomen, combined with the shining black surface of the first four abdominal tergites (except the base, hind border and lateral extremities of the first, and the hind borders and lateral extremities of the remainder), serves to make the present species noticeable among its congeners, among which, in actual size of the largest examples, females of *P. tabaninus* are its only rivals. It is therefore not a little curious, as well as unfortunate, that the holotype of *P. bellardii*—formerly in the Bigot collection, and generously presented to the British Museum (Natural History) by Mr. J. E. Collin, F.E.S.—is one of the smallest Pantophthalmids yet seen. The dimensions of a large female of *P. bellardii* in the National Collection are as follows:—Total length (ovipositor and short, blunt, facial beak included) 53·5 mm.; greatest breadth (measured across the third abdominal segment) 20·5 mm.; wing-expanse 86 mm. (nearly 3½ inches). The corresponding measurements in the case of the type are respectively 24, 9·5, and 43 mm. Moreover, apart from its diminutive proportions, the type of *P. bellardii* is anything but *typical*, since it is faded, rubbed, and somewhat shrunken, having in all probability originally been preserved in spirit before being pinned. Nevertheless, the

specific identity of Bellardi's type with even the largest member of the series of specimens under discussion is beyond question, and the examination of a small female of *P. bellardii*, which has been in the National Collection for upwards of fifty-five years, entirely supports this conclusion. In the latter specimen, as in the type, the shining transverse bands on the dorsum of the abdomen are russet-brown instead of black, and a similar coloration is exhibited by one or more of the larger females of *P. bellardii* in the British Museum.

The particulars with reference to the fifteen specimens of this species (including the type and paratypes of *Acanthomera championi* O. Sack.) in the National Collection are as follows:—One ♀ (holotype of the species), Mexico (— *Sallé*), *ex coll.* Bigot, presented by J. E. Collin, F.E.S.; one ♀ (type of *Acanthomera championi* O. Sack), Chontales, Nicaragua (*E. M. Janson*); one ♀, Orizaba, Mexico (— *Sallé*); one ♀, Bugaba, Panama (*G. C. Champion*); one ♀, R. Dagua, Colombia (*W. F. H. Rosenberg*); one ♀, provenance unknown (*ex coll.* W. W. Saunders). The remaining nine specimens, presented to the British Museum (Natural History) by Mr. J. E. Collin, F.E.S., previously formed part of the collection of the late J. M. F. Bigot, where they were placed above the label "*A. heydeni*, Wied."* Of these examples, one is from Mexico, two are from Nicaragua, and the remainder (if the general label can be trusted) from Brazil.

Of the two females of *P. bellardii* belonging to the Hope Department, University Museum, Oxford, one is from Chontales, Nicaragua, 1870 (*E. M. Janson*), the other from Peru ("E Mus. Saunders, 1867").

From what has been stated above, it will have been seen that *P. bellardii*, at any rate in the female sex, is, like other species of Pantophthalmidae, subject to great variation in size.

Infestation by Gamasid nymphs of the usual species is exhibited by at least two of the specimens in the National Collection; in the cases referred to, the pseudo-parasites in small numbers are clustered together beneath the hind margins of one or more of the distal abdominal tergites, commencing with the fourth. An Acarid pseudo-parasite of a different kind, determined by Mr. A. S. Hirst as an adult female of a species of *Macrocheles*, was found on the front (frons) of one of the Brazilian females from the Bigot collection.

According to Enderlein (Zool. Anz., Bd. xlv. no. 13, p. 585, July 28, 1914), *P. helleri* Enderl. is a synonym of *P. (Acanthomera) championi* O. Sack. It would be impossible to arrive at such a conclusion from a perusal of Enderlein's original description of *P. helleri* (*vide supra*), in which the front (frons) in the female is explicitly stated to be narrowed posteriorly, and to be less than twice as long as broad.

* *Acanthomera heydenii* Wied., though treated as a valid species by Enderlein (Zool. Anz., Bd. xli. p. 102 (1912)), is in reality synonymous with *Pantophthalmus tabanus* Thunb. (*cf.* p. 562).

Pantophthalmus splendidus, sp. n. (Text-fig. 8.)

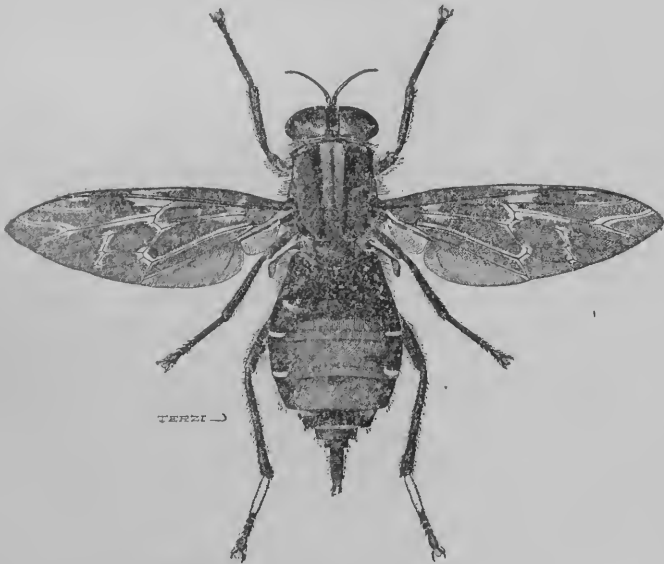
♀.—Length (one specimen), including ovipositor and facial beak, 37.0 mm.; width of head 8.4 mm.; width of front at vertex 1.25 mm.; greatest width of abdomen (across base of third tergite) 12.6 mm.; length of wing 28 mm.; wing-expanse 64.65 mm.

In ♀ *sex.* at least as represented by type, handsome, blackish-brown, black and orange-rufous species, with small, inconspicuous and only moderately sharply pointed facial beak; dorsum of thorax bearing a pair of admedian, sharply defined and conspicuous, pale olive-buff pollinose, longitudinal stripes, apparent colour of which is, in certain aspects, somewhat altered by hairy covering; blunt-edged abdomen, in which anterior portion of both second and third tergites is shining, and dorsum of which is black at base, then largely orange-rufous, with a black border on each side, in which are a small white spot, and two short, transverse, silvery-white streaks; dusky wings, with sharply defined, cinnamon-buff markings, as shown in text-fig. 8; hind femora and tibiae not so thickly clothed with hair as to appear furry, hind femora fairly stout, somewhat, though not very noticeably, incrassate towards tips, and with small subfemoral and terminal spines.

Head: front (frons), jowls and basioccipital region black or blackish-brown, face mummy-brown, inner orbits bordering face and at least upper portion of front more or less buffy-brown or sepia-coloured; front of moderate width, somewhat broader at anterior extremity than at vertex; ocelli, at least in type, orange-cinnamon; facial beak shining black, its base enveloped above with a narrow, matt, mummy-brown covering; jowls and basioccipital region clothed with fine, blackish-brown or dark mummy-brown hair; occiput smoke-grey pollinose, posterior orbits narrowly pale smoke-grey; *palpi* black or blackish-brown, distal segment somewhat swollen, pointed at tip, distinctly shorter than remaining portion of palpi, which is clothed with blackish hair, distal segment clothed with similar hair at base, and bearing two or three hairs of same kind at tip; *antennæ* slender (*i. e.* depth of third (compound) segment not greatly increased at base), blackish-brown or black, paler towards distal extremity, terminal division of third segment greyish cinnamon-coloured at tip, first and second segments somewhat sparsely clothed with black hairs. *Thorax*: dorsum, so far as can be seen, with no trace of small or minute, shining, rounded, wart-like tubercles, with which as a rule in Pantophthalmidae this region is characteristically and plentifully besprinkled; scutellum, sides of main portion of dorsum (scutum) behind humeral calli, and central area of dorsum in front of prescutellar groove and behind ends of olive-buff pollinose stripes chestnut-brown, this hue being darker on sides of scutum and brighter in case of scutellum; admedian, olive-buff pollinose stripes separated in middle line by a narrow, tapering, chocolate-brown stripe, and bordered on each side by a much broader,

blackish or blackish-brown longitudinal stripe, which, commencing on front border and occupying entire space between humeral callus and corresponding admedian stripe, is continued backwards to prescutellar groove, becoming constantly narrower as it passes backwards, and in particular diminishing markedly in width after passing beyond end of olive-buff stripe, which itself disappears shortly after crossing transverse suture; behind latter, bordering each blackish or blackish-brown stripe on outer side, is a fairly broad, curved, shining stripe; humeral calli light ochraceous-buff in front, blackish-brown behind, outer extremity in each case shining, pointed, and reddish-brown; olive-buff pollinose stripes clothed with fine, ochraceous-tawny hair, remainder of dorsum of

Text-figure 8.

*Pantophthalmus splendidus* Austen, ♀. $\times 1\frac{1}{2}$.

scutum covered with fine russet-brown or russet-coloured hair, lateral borders of scutum in front of transverse suture clothed with dark brown hair, scutellum and oblong median area immediately in front of it clothed with bright russet-coloured hair; pleurae and pectus mummy-brown, clothed with similarly coloured hair, rounded knob below base of wing on each side shining blackish-brown. *Abdomen*: first tergite black, clothed with fine black or blackish hair, and having on each lateral edge, a short distance in front of posterior angle, a small white spot; second and two following tergites orange-rufous (shining anterior border of second tergite mainly reddish-brown, at least in case of type), lateral borders black, shading off somewhat into brown on

inner margin, a short, transverse, silvery-white streak just in front of each posterior angle of second and third tergites; apart from silvery-white streaks just mentioned, on both second and third tergites non-shining area is confined to posterior half of segment, is of less depth than shining area in front of it, and has its extremities, which are far from reaching lateral margins, tapered and rounded off; fifth tergite black, moderately shining and narrowly margined (incompletely so in front) with orange-rufous; remaining tergites blackish-brown or dark brown (terminal lobes or valves ochraceous-buff, sparsely clothed with ochraceous-tawny hairs); orange-rufous area of dorsum, as also fifth tergite, thinly clothed with glistening, decumbent, ochraceous-tawny hair, shining anterior border of second tergite clothed with similar hair, second and following tergites otherwise for most part thinly clothed with black hair; venter black (second and two or three following sternites shining), thinly clothed with black hairs. *Wings* (apart from cinnamon-buff markings) mummy-brown over rather less than proximal three-fourths of costal border, then lighter or darker sepia-coloured, typical specimen at any rate with a distinctly paler area in centre of certain cells, such as discal and second posterior; cinnamon-buff markings more sharply defined and more restricted than in case of several other species of *Pantophthalmus* already described, chief markings being at base of basal cells (whence extensions are emitted, to costa on humeral transverse vein, and along fifth longitudinal vein), between costa and proximal extremity of discal cell (including anterior transverse vein and an extension thence for some distance along third longitudinal vein), and streaks embracing respectively distal extremity of second, and anterior branch of third longitudinal veins, and distal boundaries of second basal and discal cells; costa clove-brown at base, otherwise mainly cinnamon-brown, veins elsewhere mummy-brown in darker, ochraceous-tawny in lighter areas. *Halteres*: (in dried condition, at any rate) stalks mummy-brown, knobs buff-yellow. *Legs*, except first segment of hind tarsi, uniformly black and clothed with black hair; first segment of hind tarsi light orange-yellow, clothed with short, ochraceous-orange hairs, tip of segment blackish-brown or black, clothed with similarly coloured hairs, extreme base of segment also blackish-brown; claws black; pulvilli and empodia ochraceous-buff.

Panama: Chiriqui Volcano, between 5000 and 9000 ft., 1915 (*H. J. Watson*).

Owing to its distinctive coloration and markings, *Pantophthalmus splendidus*—in the ♀ sex at any rate—cannot be confused with any of its congeners already known.

The specimen from which the above description has been drawn up bears, on the fifth and following abdominal segments, a small number of nymphs of the species of Gamasid mite (genus *Trachytes*) that has been mentioned so often in the course of this paper as occurring on various species of Pantophthalmidæ. In addition to

these pseudo-parasites, a few other nymphal mites, apparently conspecific with the foregoing, were found on the left side of the thorax, among the hair on the anterior border of the mesopleura.

***Pantophthalmus variegatus*, sp. n. (Text-fig. 9.)**

♀.—Length (four specimens), including ovipositor and facial beak, 29.5 to 36.25 mm.; width of head 7.5 to 9.2 mm.; width of front at vertex 1.4 to 1.5 mm.; greatest width of abdomen (across hind border of second tergite) 9.8 to 13.0 mm.; length of wing 25.0 to 28.5 mm.

Strongly marked species, with, in ♀ sex at any rate, dorsum of thorax vinaceous-buff, conspicuously striped and spotted with black or blackish-brown, and with dorsum of abdomen ochraceous-orange or orange-rufous, with sharply defined black lateral borders, in each of which are four transversely elongate, silvery-white spots, the fourth pair of spots less conspicuous than the others and sometimes indistinct; facial beak prominent but not sharp pointed; wings strongly infuscated, mummy-brown at base, then sepia-coloured or fuscous, with ochraceous-buff or cream-buff markings as shown in text-fig. 9; hind femora incrassate towards tips, with very small terminal spine, subfemoral spine likewise small, difficult to distinguish among the hair.

Head: front (frons) warm buff, of moderate and uniform width; in middle line, just above bases of antennæ, a narrow, short, somewhat sagittate, brownish streak; ocellar tubercle black, bluntly ovate, sharply defined and conspicuous; face dark seal-brown (facial orbits narrowly olive-buff), below facial beak with an ochraceous-orange transverse band, extremities of which turn upwards on each side of base of beak, a similar but paler (light ochraceous-buff) band, about half the depth of the former, immediately above bases of palpi; jowls and basioccipital region mummy-brown or cinnamon-brown, clothed with similarly coloured hair; facial beak of moderate length, blunt (not sharp-pointed) at tip, which is shining black or blackish-brown, proximal three-fourths of beak enveloped, except below, with a matt, dark seal-brown, smooth (not transversely rugose) covering; occiput light buff (immediately adjacent to posterior orbits ochraceous-buff), clothed with glistening, ochraceous-buff hairs, which become brownish towards tips; first and second segments of *palpi* sepia-coloured or dark brown, clothed with reddish-brown or dark brown hair, and together longer than or at least as long as distal segment, latter blackish-brown or black (sepia-coloured at base), moderately swollen beyond proximal fourth, and sparsely clothed, at least on outer side and at base, with short, reddish-brown hairs; *antennæ* warm buff, second segment with a circlet of russet coloured hairs at distal extremity, third (compound) segment slender, showing but little increase of depth at base. *Thorax*: dorsum of main portion (scutum)

vinaceous-buff pollinose, with, as shown in text-fig. 9, on anterior two-thirds a pair of fairly broad, black or blackish-brown longitudinal stripes, and on each side, behind transverse suture, a pair of similarly coloured spots, the larger of which occupies postalar callus, while the other, much smaller spot is situate above base of wing, just behind outer extremity of transverse suture; a short distance in rear of latter, each longitudinal stripe becomes partially obliterated or is tapered off obliquely from in front outwards, and is then continued to prescutellar groove by a narrower and paler extension, each extension ending on anterior wall of groove in a somewhat ill-defined, darker, spot-like termination, which is in contact with its fellow; scutellum black or blackish-brown, its outer extremities silver-grey pollinose on a pale ochraceous-

Text-figure 9.

*Pantophthalmus variegatus* Austen, ♀. $\times 1\frac{1}{2}$.

buff ground; dorsum of scutum clothed with ochraceous-buff hair, stripes, spots, and scutellum clothed with brownish or dark brown hair; humeral calli warm buff or cream-buff, outer extremities and a spot on upper surface at base dark brown; pleurae and pectus mummy-brown, clothed with similarly coloured hair. *Abdomen*: first four tergites, at least in typical series, ochraceous-orange or orange-rufous, their lateral extremities, which are somewhat deflexed, black and sharply defined, with a transversely elongate, silvery-white spot in posterior angle of each tergite, spots on fourth tergite smaller than the others and sometimes indistinct; remaining tergites, including ovipositor, mummy-brown, a larger or smaller area in centre of base of fifth

tergite ochraceous-orange or orange-rufous; sixth and seventh tergites, fifth tergite except area just mentioned, and lateral borders of preceding tergites, except silvery-white spots, clothed with dark brown, blackish or black hair; first tergite, except lateral extremities, thinly clothed with fine, decumbent, glistening ochraceous-buff hairs, remainder of ochraceous-orange or orange-rufous area of dorsum very sparsely clothed with short or minute hairs of similar colour; venter mummy-brown, thinly clothed with fine, dark brown hair. *Wings*: markings very similar to those exhibited by *Pantophthalmus batesi* Austen (cf. figs. 9 and 2); costa, from a short distance beyond base, mainly cinnamon-coloured; veins elsewhere partly mummy-brown, partly sepia-coloured, except in pale areas where they are cinnamon-buff; teguliform swelling at base of costa ochraceous-buff, large and conspicuous. *Halteres* (in dried condition at any rate) sepia-coloured. *Legs*: first segment of all tarsi (except extreme tips), also extreme bases of following segments in case of front pair, honey-yellow, ochraceous-buff or cream-buff, clothed with short, glistening, cream-coloured or cream-buff hair; legs otherwise clove-brown or chocolate-brown (last four segments of hind tarsi sometimes blackish-brown or black), clothed with fine, similarly coloured or blackish hair, which is closely set on hind femora and tibiae, so that these segments, or at least hind tibiae, have a furry appearance; claws black, sometimes russet-coloured at base; pulvilli and empodia ochraceous-buff.

Brazil. Holotype, precise locality unknown, before 1849 (Mrs. Noel); one paratype, Parana, about 1906 (*E. Dukinfield Jones*); a second paratype, precise locality unknown, *ex coll.* J. Bigot (presented by Mr. J. E. Collin, F.E.S.). A third paratype, without any indication of locality, but bearing two labels, each with the words "*seticornis*, Wied.", and in one case with the addition of "E Mus. Saund.: 1867. 10d" in J. O. Westwood's handwriting, is in the possession of the Hope Department, University Museum, Oxford. The holotype is the specimen called by F. Walker (List Dipt. Ins. in coll. Brit. Mus., Pt. i. p. 210, 1848) *Acanthomera seticornis* Wied. The paratype from the Bigot collection was placed by its original owner above the label "*A. frauenfeldi*, Schiner." It may be of interest to note that, in the wings of the paratype from Parana, the second posterior cell is closed and petiolate, although in all other respects, apart from *post-mortem* shrinkage of the abdomen, the specimen is normal.

While the thoracic spots in the case of *Pantophthalmus variegatus*, ♀, are similar to those exhibited by both sexes of *P. vittatus* Wied., though the posterior lateral spot is much larger in the species characterized above, the distinctive thoracic stripes in *P. variegatus* will at once serve to separate it, not only from *P. vittatus*, but also from any other *Pantophthalmid* in which at any rate the female sex is known.

It only remains to add that nymphs of the usual species

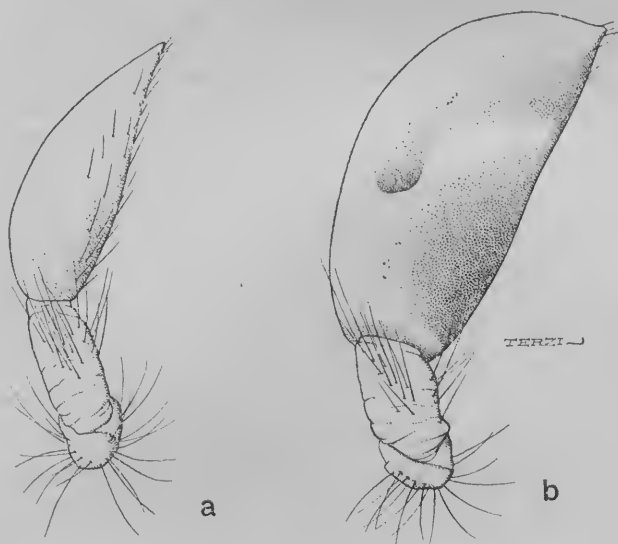
of Gamasid mite, albeit in small numbers, are present on the abdominal tergites of at least two of the paratypes, as well as on those of the holotype of *P. variegatus*.

Genus **Rhaphiorhynchus** Wiedemann.

Rhaphiorhynchus Wiedemann, *Diptera Exotica*, Pars i. p. 59 (1821).

In spite of the lapse of more than a century since this genus was first described, the genotype, *Rhaphiorhynchus planiventris* Wied., is still the only species that can be assigned to it; as explained below (*cf.* p. 597), it now seems more reasonable to found a distinct genus for *Rhaphiorhynchus rothschildi* Austen,

Text-figure 10.



Left maxillary palpus of *Rhaphiorhynchus planiventris* Wied.; a, ♂; b, ♀.
Inner (ventral) aspect in each case.

which was described in 1909. At the same time, the distinctive shape of the terminal segment of the palpus in *Rhaphiorhynchus planiventris*, especially in the female, precludes any thought of including this species in the genus *Pantophthalmus*. As shown in fig. 10, the distal segment of the palpus in *Rhaphiorhynchus*, while distinctly swollen and fusiform in the male, is enormously dilated in the opposite sex and, viewed from below, is decidedly reniform. A prominent and sharp-pointed facial beak, and a

well-developed subfemoral spine on the hind legs are present in both sexes.

Rhaphiorhynchus planiventris Wied.

Rhaphiorhynchus planiventris Wiedemann, Dipt. Exot. i. p. 60, Tab. ii. fig. 1 (1821).

Acanthomera crassipalpis Macquart, Mém. Soc. roy. des Sc., de l'Agric. et des Arts de Lille, Année 1846, p. 43, Tab. i. fig. 3 (1847).

Acanthomera bigoti Bellardi, Saggio di Ditterol. Messicana, Appendice, p. 16, Tav. iii. fig. 10 (1862).

The specific identity of *Acanthomera crassipalpis* Macq. and *A. bigoti* Bell. with *Rh. planiventris* Wied. was recognized long ago by Baron C. R. Osten Sacken (Biol. Centr.-Amer., Diptera, vol. i. p. 66 (1886)).

The undermentioned specimens of *Rh. planiventris* are in the British Museum (Natural History):—One ♂, David, Chiriqui, Panama, and one ♀, Bugaba, Panama, 800–1500 ft.—both collected by Mr. G. C. Champion, and determined by Osten Sacken (*loc. cit.*); one ♀, Provincia Sara, Santa Cruz de la Sierra, Bolivia, February–April, 1904 (*J. Steinbach*). From the Bigot collection, Mr. J. E. Collin has kindly presented the type of *Acanthomera crassipalpis* Macq. (a ♀, stated by Macquart, *loc. cit.*, to be from Guatemala), and two additional ♀ ♀, from Chontales, Nicaragua, all of which, with a ♀ of *Pantophthalmus* (*Acanthomera*) *frauenfeldi* Schin. (*vide supra*, p. 565), were placed by Bigot above a label inscribed "*Acanthomera crassipalpis* Macq., n. sp. ♀."

In the Hope Department of the University Museum, Oxford, this species is represented by three ♀ ♀, of which two are from Chontales, Nicaragua, 1870 (*E. M. Janson*), while the third is simply labelled "America. aeq."

The Liverpool School of Tropical Medicine possesses a ♀ of *Rh. planiventris* from the R. Amazons, Brazil, "on board S.S. 'Hildebrand,' 25.ii.1920, 6.30 p.m." (*Dr. Clarke*).

All three Oxford specimens show the nymphal stage of the usual species of Gamasid mite on the dorsal surface of the abdomen; in two instances, however, only a single parasite is visible, while in the third case the nymphs number less than a dozen.

Genus *Atopomyia**, nov.

Distinguished, at least in ♂ sex, from both *Pantophthalmus* Thunb. and *Rhaphiorhynchus* Wied. by the narrow, elongate shape of the body, and the form of the third (compound) segment of the antenna. The latter, instead of its broader (proximal) portion being more or less abruptly truncate (or tapering quickly to a point), and bearing terminally a fine, setiform arista (as in

* ἀτ. πος, strange, extraordinary, μῦα, a fly.

Pantophthalmus ♂), or being lanceolate (as in *Rhaphiorhynchus planiventris* Wied., ♂, *apud* Macquart, Mém. Soc. Roy. des Sc., de l'Agric. et des Arts de Lille, Année 1838, 2^{ième} Partie, pl. 20. figs. 3, 3 a, 1838), is narrow and subulate, with its terminal annulus elongate, rod-like, abruptly attenuate and pointed at the tip, and bearing a few minute hairs towards the end, in addition to a longer recumbent hair above and below, just before the middle. Distinguished further, from both genera mentioned, by the palpi (at least in ♂) being densely clothed with stiff hair, instead of the distal segment being practically bare; distinguished also from *Rhaphiorhynchus* by distal segment

Text-figure 11.

Left antenna of *Atopomyia rothschildi* Austen, ♂, from the inner side.

of palpi not being characteristically swollen as in that genus, and being decidedly shorter than remaining portion of palpus, instead of *vice versâ*. Face with a large, thick beak, pointed at tip, thickened portion more or less distinctly wrinkled transversely. Dorsum of thorax, at least in ♂ of genotype, devoid of the small or minute, rounded, wart-like tubercles, which, though varying greatly in different species, in size and number, are characteristic of the majority of Pantophthalmidæ, though apparently not present in all, at any rate in both sexes. Hind legs with a large subfemoral spine; terminal spine on hind femora very small, at least in genotype.

Genotype—*Rhaphiorhynchus rothschildi* Austen.

Atopomyia rothschildi Austen.

Rhaphiorhynchus rothschildi Austen, Novitates Zoologicæ, vol. xvi. p. 129 (May 1909), and vol. xvii. pl. xv. fig. 1 (December 1910).

Although at the time of describing this striking species the author considered that there were no real grounds for separating it from *Rhaphiorhynchus* (*cf.* Austen, *l. cit.* vol. xvi. p. 130), it seems advisable on further consideration to reverse this view, especially when regard is paid to the important palpal characters to which attention is drawn in the generic diagnosis above.

The type of *A. rothschildi*—a ♂ from Buenavista, Bolivia (*J. Steinbach*)—is in the Tring Museum, and the British Museum (Natural History) possesses a paratype of the same sex from Ecuador (*Buckley*). During the fourteen years that have elapsed since the species was described, no further specimens of it have

been added to the National Collection or seen by the author ; but it may be noted that two ♂♂ of *A. rothschildi*, from Peru and Chiriqui, Panama, respectively, were in the possession of the late Professor Hermann (*cf.* Hermann, Deutsch. Ent. Z., Jahrg. 1916, Heft i. p. 47, 1916).

According to Lord Rothschild (Nov. Zool. vol. xvii. p. 461, December 1910), *Atopomyia rothschildi* mimics the Hymenopteron *Pepsis elevata* Fabr., which is doubtless the explanation of the curious contrast in its general *facies* presented by this species, as compared with any other Pantophthalmid at present known.

XXIX. *The Geographical Races of Heodes phlaeas* L. By
EDMUND B. FORD. Communicated by Comm.
J. J. WALKER, M.A., R.N., F.L.S.

[Read December 5th, 1923.]

PLATE LIV.

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A. GENERAL OBSERVATIONS.

THERE are comparatively few species of Diurnal Lepidoptera which have a wider range of distribution than *Heodes phlaeas* L. Throughout the greater part of the Northern Hemisphere this insect is to be found, extending southwards to the Ethiopian Region, while to the north it has been captured with four other species in Grinnell Land, at the highest latitude at which *Rhopalocera* have so far been observed. It varies seasonably and geographically to a remarkable extent, and produces many striking and constant local races, while specimens from almost every district differ in some minute particulars which can be detected by the careful analysis of a long series. These variations have never been worked out with adequate material, and it is the object of this paper to consider them in relation to the distribution and seasonal dimorphism of the species. I am greatly indebted to Prof. E. B. Poulton, F.R.S., for suggesting this investigation in the first instance, and for his unfailing help ever since. It is entirely due to his kindness in placing the resources of the Hope Department of the University Museum of Oxford at my disposal that it has been possible to undertake it.

I should like to express my best thanks to Lord Rothschild, F.R.S., for entrusting to me, for many months, the whole of the unrivalled material from the Tring Zoological Museum; to Mr. J. J. Joicey, F.L.S., who so kindly sent for examination the extensive and interesting series from the Hill Museum, Witley, and to the authorities of the Natural History Museum, South Kensington, who gave me every opportunity of inspecting the unique specimens in the National Collection. I am most grateful to Dr. H. Eltringham for his kindness in preparing and painting the plate illustrating this memoir, and to Mr. Alfred Robinson for the trouble he has taken in photographing the specimens. To Commander J. J. Walker, R.N., F.L.S., I am indebted for many very valuable suggestions, also to Mr. G. T. Bethune-Baker, F.L.S., for giving me the opportunity of examining the remarkable and historic examples in his collection.

B. SEASONAL DIMORPHISM.

The varieties of *Heodes phlaeas* may be regarded as coming under three headings: Geographical, Seasonal, and Casual Variation. It is with the first of these that this paper is chiefly concerned, but it is necessary to say something of the other two.

1. *Weismann's Experiments.*

Seasonal and geographical variation are not easily dissociated. In some localities the difference between the spring and summer broods is indeed most remarkable, in others it is almost imperceptible. Thus it will be convenient to consider some of the principal characters of seasonal variation at once, and to leave the others to be discussed in connection with the geographical distribution. Several authors have paid considerable attention to this subject, but the work of Weismann is the most detailed, and his experiments on the species are famous. He noticed that in Germany the spring and summer broods resemble one another, while in Italy they exhibit marked seasonal dimorphism; the spring brood being similar to the German, but the summer form having the wings more or less clouded with black, often almost to the exclusion of the coppery ground-colour. By subjecting to a high temperature the pupae obtained from a German spring form, he produced a brood darker than the normal, but not so dark as the

Italian specimens of the second generation; while, by subjecting pupae obtained from Naples to a low temperature at Freiburg, he produced a summer brood lighter than the Neapolitan insects, but darker than the German. His explanation of these results in the light of his theory of the germ-plasm is interesting. He says: "The germ-plasm of the Southern Colony must contain many determinants among those for the wings which, in consequence of the exposure of thousands of generations to heat, have been adapted for the production of black scales, together with a large number of others which only require a small increase of temperature during pupation in order to give rise to a black colour. These latter kind cause such fluctuations as occurred in my experiments; while the former produce the black coloration of the wings which has become fixed in the constitution of the Southern Colony, and can no longer be removed by the action of cold on the young chrysalis." *

2. *Various Observations: Constant and Racial Broods defined.*

Generally speaking, summer specimens are darker than spring or late autumn insects, sometimes extraordinarily so, and this tendency is, with few exceptions, accentuated progressively southwards. Frequently correlated with it is an increase in the length of the tail, situated at the end of the second nervure of the hind-wings, and more rarely of a pointed prolongation of the anal angle: both may be made more conspicuous by a deep indentation of the outer margin between them. This dark, long-tailed form is var. *eleus* F., but it is subject to such remarkable geographical variation that the name can only be regarded as having a vague general significance. Except in the far north, several broods of the species succeed one another during each year, the number depending generally on the locality and, to some extent, on the season. In favourable climates three, four or even more broods are the rule. These may be regarded as falling into two groups: the cold-weather forms, produced in the early spring and late autumn, which resemble each other, and the hot-weather forms, produced

* Weismann, "The Germ-plasm: a Theory of Heredity" (translated by Newton Parker and Rönnfeldt), p. 399 *et seq.* For a further account of these experiments see p. 420 of the same work and "Studies in the Theory of Descent" (translated by Raphael Meldola), pp. 49-50 and p. 54 *et seq.*

in the summer, which are also nearly alike. The spring and autumn specimens belong to what I have called the Constant Broods, and approximate to the typical form of the species, such as occurs in these islands; the summer specimens, which belong to what I have called the Racial Broods, are produced at a time when the high temperature and peculiar climatic conditions of a given locality can most readily act upon the pupa and produce their characteristic effects. These names are purely arbitrary, and are designed primarily to avoid circumlocution; nevertheless, in the great majority of cases, they have a considerable value in the study of this insect. I speak of Constant Broods because they are relatively constant in their appearance throughout the range of the species; of Racial Broods, because in them are manifested all the extreme forms of the local races. It will be seen, therefore, that specimens of *Heodes phlaeas* from any number of given localities resemble one another more closely in the Constant than in the Racial Broods. Setting aside the Occasional Aberrations, which occur indiscriminately in both, exceptions to this rule are very uncommon.

3. *The Climatic Effect on Racial Broods.*

Since the peculiar characteristics of the Racial Broods are the result of heat in the pupal stage, it follows that they must be more pronounced in hot seasons than in cool ones. In the south, where the insects are extensively suffused, a slight increase of dark pigment is not perceptible; further north, however, it produces a marked effect. In such a climate as that of England the ground-colour generally remains fairly bright at all times. When three broods occur they are hardly to be distinguished from one another, though nearly always the second, which is really the Racial Brood, is slightly duller than the other two. It is only in exceptional circumstances that it really differs from them, and we see operating here the same process which produces such striking seasonal dimorphism further south. There are in the Hope Department at Oxford most remarkable illustrations of this climatic effect. Dr. R. C. L. Perkins, F.R.S., captured thirty-seven specimens on the same bank at Cerne Abbas, Dorset, twenty-one in August 1911, one of the hottest years within living memory, and sixteen in August 1912, one of the

coldest and wettest. They are of unusual interest, all belong to the Racial Brood, and eight out of the fourteen 1911 males are darker than any of the eight males taken in 1912, while, in both sexes, the copper tint is more brilliantly lustrous in 1912 than in 1911.* During the present year (1923) Mr. A. H. Hamm has captured a series of one hundred and fifty-five specimens at Hogley Bog, Bullingdon, Oxford. They show that even in the most unfavourable seasons the second brood is slightly darker than the others. He has carefully supplied them with the most minute data. Seventeen captured on June 23rd are bright and fiery, with the spots on the fore-wings very small. By August 19th a second brood had appeared, and the sixty-two specimens captured on that day are distinctly dull and present a striking contrast to the earlier insects. The thirty-nine specimens captured on August 26th show the same characteristics, but on September 2nd, among twenty insects, are six very bright newly emerged examples. These may be a retarded emergence or, more probably, a third brood; in either case they show in a marked manner the effect which the unusual cold at the end of August exercised on the pupa. On September 9th eight specimens out of seventeen show the same effect. Another interesting series of one hundred and three specimens, captured near Newbury in September 1921, also by Mr. Hamm, provides an excellent example of a third brood in this country.† In that summer, which was throughout very hot, the ground-colour of the second brood was quite dull, but that of the third is as bright as any spring specimens, thus illustrating the similarity of the two Constant Broods.

It should be noticed that in all cases the male is much more strongly affected by heat in the pupal stage than the female; so that in those southern localities, where the suffusion is very great, *Heodes phlaeas* becomes, in the Racial Broods, a sexually dimorphic butterfly. Differences of shape and size also appear: this is to some extent a geographical effect, for it is more pronounced in the Far East than in the West, even though the quantity of suffusion may be less.

* Proc. Ent. Soc. Lond., 1912, p. cxxxviii.

† For a further account of these specimens see Proc. Ent. Soc. Lond., 1921, p. cvi.

C. OCCASIONAL ABERRATIONS.

1. *Some of the named Forms.*

There are a certain number of Occasional Aberrations which may appear in any brood or in any locality. In what are, perhaps, the most striking examples of these the copper is replaced by a yellowish-white or cream colour (ab. *schmidtii* Gerhart; Plate LIV, fig. 7) or by a pure white (ab. *alba* Tutt; Plate LIV, fig. 13). They are the end result of a long series of variations graduating imperceptibly from the normal copper ground-colour, among which ab. *cuprinus* Peyer, *intermedia* Tutt, and some others have received names. Not infrequently individuals appear with one white or brass-coloured wing; generally they are not to be regarded as asymmetrical examples of the normal varieties, but are pathological in origin, for the wing appears bleached in many cases, and the scales may be twisted or otherwise deformed. On the other hand, the ground-colour may remain typical, while the spots on the fore-wings alter in tone, to grey in ab. *webbi* Tutt, or to white in ab. *huebneri* Tutt. These spots may vary in size and shape in a highly remarkable manner. They may be greatly reduced in number, so that the fore-wings are entirely coppery save for the black border and the two cell-spots (ab. *bipunctata* Tutt), and ultimately even these disappear in ab. *obliterata* Scudder. The spots of the distal series are, however, frequently enlarged (ab. *magnipunctata* Tutt) until they touch one another (ab. *koebi* Stgr.), and finally coalesce into a continuous band in ab. *fasciata* Streck. They may be oval in shape or modified into streaks, with which the cell-spot occasionally unites (ab. *conjuncta* Tutt). These aberrations are frequently repeated on the underside or may occur on that surface alone. The red band at the margin of the hind-wings is somewhat rarely broken up into a series of wedge-shaped markings (ab. *radiata* Tutt), and may even disappear completely (ab. *obsoleta* Tutt). Sometimes, however, it is abnormally broad or may be continued in streaks up the nervures (ab. *subradiata* Tutt). A character which is racial in one locality may be found in others as an occasional aberration. For example, in Western Europe a form appears now and then in which the usual copper is replaced by a fiery red (ab. *ignita* Tutt), yet this is a normal

feature of the race occurring in the Tian-Shan. These various modifications are almost endless, and a large proportion of them have received names. It would be profitless to repeat these here, as many refer to examples which are intermediate in some degree between the type and the more extreme aberrations cited above. They may all be found, when required, in an excellent article on this species by the late Mr. J. W. Tutt.*

2. *Caeruleo-punctata* Stgr.

Before leaving this subject, the blue spots so often seen immediately within the red band on the hind-wings (var. *caeruleo-punctata* Stgr.) deserve consideration. It is not often that they form a very important factor, for they appear and disappear in a very confusing manner even in the most striking and constant local races. Two forms are, so far as is known, exceptional in this respect: in *aethiopica* Poulton,† they are a constant feature, and they do not occur in the Racial Broods of China. It has been suggested that they occur in a larger percentage of specimens from marshes than from dry ground, and an interesting discussion on this subject is to be found in the Entomologist.‡ The evidence there brought forward seems conflicting, and I cannot say that my own observations have in any measure corroborated this theory. It appears to me that, if *caeruleo-punctata* were the form of the species inhabiting damp places, we might reasonably expect to find an increase in the percentage of specimens exhibiting blue spots in districts where the rainfall is heavy and marshes are frequent, and, conversely, a decrease in this percentage among a large random selection from drier countries. From the data given later in this paper it will be found that such is not the case. Mr. Hamm has also come to the same opinion, for, speaking of a series which he captured on Greenham Common, "one of the highest and driest places near Newbury," he remarks: "A few are of the *caeruleo-punctata* form, a variety supposed to occur more frequently in damp situations, but here as common in the high and dry locality as in the others." §

* "A Natural History of the British Lepidoptera," vol. viii, p. 330 *et seq.*

† See p. 703.

‡ Entom., vol. liii, pp. 233, 284, 285; vol. liv, pp. 17, 101; vol. lv, p. 36.

§ Proc. Ent. Soc. Lond., 1921, p. cvii.

In the article previously cited, Mr. Tutt deals with this aberration at some length. He quotes a reference to a paper by Weismann translated in the *Entomologist*,* and, after transcribing fairly closely, continues: "If specimens from the south be compared with those from the north, it is seen that well-developed [blue] spots and their indications are much more frequent, but that no correspondence exists between climate and degree of perfection of the spots." The opinion here expressed is contrary to my own observations, for I have been unable to detect any correlation between the latitude and the frequency of the *caeruleo-punctata* form. To illustrate this point I have selected, from the following data, eight localities, all in the western part of the Palaearctic Region, and have arranged them according to their latitude.

Locality.	The <i>caeruleo-punctata</i> form.	
	Constant Broods.	Racial Broods.
Udevalla (Sweden) . . .	—	35%
Bullingdon, Oxford . . .	18%	17%
Bihar Comitât (Hungary) . .	19%	24%
France (Mediterranean Coast)	29%	28%
Sicily	?	18%
Algiers (Town)	18%	12%
Cyprus	41%	47%
Southern Algeria	21%	?

It will be seen that the proportions in which the *caeruleo-punctata* form occurs are quite irregular, but that they do not differ widely in the two types of brood from the same place; exceptions to this rule are uncommon. It is noteworthy, also, that in some localities the higher numbers occur in the Constant Broods, in others in the Racial: a condition very different from that obtaining in regard to the Critical Spot (pp. 731-732).

The above examples may be amplified from the data given later in this paper, where a description will be found of the forms occurring in very numerous localities throughout the range of the species, and the percentage in which the blue spots appear is there recorded in each case. Weis-

* *Entom.*, vol. xxix, pp. 74-75.

mann seems definitely to have held the same opinion in regard to the lack of correlation between the *caeruleo-punctata* form and the latitude, for on turning to the article mentioned above I find, in place of the passage given by Tutt, the following: "If specimens from the south are compared with those from the north, it turns out that well-developed spots occur in individuals everywhere, that indications of them are frequent everywhere, but that no correspondence exists between the climate and the degree of perfection of the blue spots." I do not know whether Tutt misread the passage or was drawing his own conclusions from Weismann's data.

D. THE GEOGRAPHICAL RACES.

1. General Remarks: previous work.

To turn, however, to the geographical races. Mr. Tutt remarks that "The variation of *Rumicia* [*Heodes*] *phlaeas* is one of the most difficult subjects with which we have to treat," and this has generally been recognised by entomologists. It is to be accounted for in part by the seasonal dimorphism, which varies from year to year and is extreme in some localities, almost unnoticeable in others, but chiefly by the nature of the local races. Some are most striking, and often have certain features common to them at all times of the year with others superimposed, as it were, on the Racial Broods; in other places it is these broods alone which are remarkable. More frequently slight though constant changes of colour are the only distinctions perceptible, while often the geographical forms are due to a shifting of the average in some small respect. It is not surprising that they have always attracted attention, and entomological literature contains many interesting observations upon individual races and one or two more general surveys, among the most valuable of which are: that part of Mr. Tutt's great work on British Lepidoptera which deals with this species; * the article on *Heodes phlaeas* in "The Macrolepidoptera of the World," by Dr. Seitz; † and a paper by Dr. Chapman in the Entomologist's Record.‡ The

* "A Natural History of the British Lepidoptera," vol. viii, p. 330 *et seq.*

† "The Macrolepidoptera of the World," Section 1. The Palaearctic Region (translated by Dr. K. Jordan), vol. i, pp. 285-286.

‡ The Entomologist's Record, 1904, vol. xvi, p. 167 *et seq.*

first of these is an admirable and comprehensive account of the species, giving most minute particulars of the Occasional Aberrations, but, being a work on British Lepidoptera only, the various Geographical Races are not fully dealt with. The able passage in "The Macrolepidoptera of the World" above referred to is necessarily very short, and the same remark applies to Dr. Chapman's paper, in which I find the following observation: "The greatest variation in colour occurs in the amount of black scaling. This occurs in two very distinct ways, viz., by greater extension of the black areas, spots, hind margin, etc., and by a suffusion of black scales. The former not unfrequently occurs with hardly any of the latter, but suffusion of the copper is almost always associated with some increase of the black areas. The evidence of the specimens submitted is to the effect that both these are the result of heat in the earlier stages, that is, that it is entirely climatic and in no definite way geographical or racial."

It is certainly true that the amount of suffusion on the fore-wings is subject to the most extraordinary variation, that it is of the two types described by Dr. Chapman, and that it is the result of increased heat in the earlier stages. The study of large collections from numerous localities makes it appear, however, that its character is dependent on the Geographical Races to a very considerable degree. Thus in Italy and Syria the fore-wings of the Racial Broods are extensively suffused, the exact amount depending on the individual, the sex and the season. Though this suffusion takes place on parallel lines in the two localities, it is always perfectly distinct. The rich black of the Italian specimens could never be confused with the dull lustreless brown of the Syrian forms by anyone who has once examined them.

2. *The Range of the Species.*

In order to obtain sufficient data for the following account of the Geographical Races of *Heodes phlaeas* I have examined minutely between four and five thousand specimens from its entire range, and many others sufficiently to ascertain whether they are true to the form which is typical of their locality. The species occurs practically through the whole of the Palaearctic and Nearctic Regions, as well as the northern part of India in the Oriental Region. Within the Continent of Europe the Geographical Races are

often separable only by comparatively small details. Excluding the Arctic forms they are to be distinguished more by a change of the average in some slight respect than by any outstanding characters, although the Racial Broods of the south are, broadly speaking, very different from those of the north, owing to the greater amount of suffusion of the fore-wings in the former. This general uniformity offers a surprising contrast to some of the remarkable races which occur in other parts of the world.

3. The Ethiopian Forms.

The only portion of the insect's range with which this paper does not deal is the Ethiopian Region, where it is found in three very singular forms—*abboti* Holland, *pseudophlaeas* Lucas, and *aethiopica* Poulton. The whole question of their occurrence has been discussed very fully by Prof. Poulton,* so that it is unnecessary to deal with the matter here. I might add, however, for the sake of completeness, that they are quite unlike any other known forms, with the possible exception of one or two specimens captured far to the south near the western border of the Sahara.† The three forms differ considerably from one another, but in general it may be said that the copper ground-colour has a very distinctive tone: it is rather pale, of a very curious brickdust shade, and strongly metallic. The copper band near the margin of the hind-wings is unusually broad, and these wings are themselves more or less thickly dusted with metallic scales up to the base. On the underside their colour is a rich red-brown, which is quite characteristic. It is a singular fact that here, at the southern limit of the species, no examples have been recorded which show the smallest trace of suffusion.

4. The Genitalia.

Dr. Chapman has made a report on the genitalia of these Ethiopian forms.‡ He finds that they do not differ from those of *H. phlaeas phlaeas* save in a slight diminution in size, which is most noticeable in the aedoeagus, "which is 2.0 to 2.1 mm. long in Northern *phlaeas* and 1.63 to 1.75 in the African forms." There is also a greater constancy in

* Proc. Ent. Soc. Lond., 1921, pp. lxxxii-lxxxvi; 1922, pp. li-lvi and xciv-xev; also, 1923, pp. xxii-xxiv.

† *Ibid.*, 1923, pp. xxiv-xxv. See also p. 719 of this memoir.

‡ *Ibid.*, 1921, p. lxxxii *et seq.*

the outline of the penis sheath. He says, "It is possible to regard these as specific characters. For my own part I regard them as items of geographical variation, still far short of implying specific distinction. . . ." He then proceeds to state his conclusions on a matter intimately connected with this present paper—the relation between *H. phlaeas phlaeas* and *H. phlaeas hypophlaeas*. He examined the genitalia of these two forms and remarks: "I may say that I regard *hypophlaeas* (Lapland and N. America) as specifically identical with *phlaeas*. The appendages don't differ at all. . . ."

5. *Methods used in describing the Geographical Races.*

In describing the various local forms I have, of course, relied upon the abnormal and distinctive characters which they may possess. Frequently, also, I have made use of one or two modifications of the ordinary shape and markings; such as the length of the tail, the quality of the suffusion and the area of the wing which it covers, when present; also the colour of the underside of the hind-wings and any markings thereon. One of the most interesting of these distinctions is the shape of the first spot in the distal series above the hind margin of the fore-wings, situated between nervures 1 and 2. Prof. Poulton has shown the value of this character in describing the Ethiopian forms of the species. For the sake of brevity I shall refer to it as the *Critical Spot*. It is comparatively long and narrow; its form is essentially double—this is more clearly seen on the underside but, even above, it may be divided into two distinct spots. It may be constricted hour-glass-like, but normally its shape is crescentic and its direction variable. When the concavity faces outwards I shall simply refer to it as *turned out*; when it faces inwards I shall call it *turned in*. That is to say it is the concavity, not the convexity, which is always referred to. If a large number of specimens from all broods be captured in a given locality, it will be found that the percentage having the Critical Spot definitely turned inwards and definitely turned outwards is fairly constant. These proportions differ widely in the various local forms, in complete accordance with Prof. Poulton's expectation that, when sufficient material could be obtained, the shape of this spot would prove to be a racial character.* In every district its direction is doubtful in a

* Proc. Ent. Soc. Lond., 1922, p. liv.

certain number of specimens, and in a few instances it is divided into two.

In describing the Geographical Races of *Heodes phlaeas*, I have attempted to follow, as far as possible, a linear order, tracing the variations from one country into the next. It is, of course, impossible to carry out such a plan completely. Starting with Britain I have followed with France, taking the Channel Islands on the way, then through Spain (with Majorca) into Portugal. Commencing again with the coast of the Baltic I have discussed the forms to be found in Germany, Hungary, Switzerland, the Italian Peninsula and the adjacent islands. From this point I have described the races inhabiting the countries bordering the Mediterranean, travelling east along the north coast and west to Morocco along the south, completing the western habitat with the Canary Islands and Madeira. In Asia I have followed an imaginary line running east from Syria to the coast of China, deviating north or south on the way when necessary, and completing the Palaearctic Region with Corea and Japan. After giving an account of the Oriental and Nearctic Races, I have devoted a section at the end of the paper to the circumpolar forms; for their affinities can be determined more readily when the eastern part of the Palaearctic Region has been dealt with. Furthermore, by their study we gain some light on the origin of *H. phlaeas hypophlaeas* in North America.

E. THE PALAEARCTIC REGION.

I. Europe and the Mediterranean Coast.

Owing to the small differences which are observable among the races of Europe and the Mediterranean coast a standard form of description is necessary. The Constant and Racial Broods will be kept distinct, though as the former hardly vary within the limits of this section, they will only be considered fully in a few instances. In each locality I have recorded the percentages, to the nearest whole number, in which the Critical Spot is turned in and out, giving in addition the data from which they were calculated. They rarely amount to 100%, since, in almost every case, their direction is doubtful in many specimens. When less than twenty-five examples of a brood have been obtainable I have recorded only the actual numbers. When the tail is mentioned in the following descriptions,

without explanatory remarks, it is the true tail, situated at the end of the second nervure, which is referred to; not a pointed prolongation of the anal angle. In the region under discussion, the markings on the lower surface of the hind-wings, which form such a crucial test elsewhere, are constant and uninteresting. It will be convenient, therefore, to describe them forthwith, and to omit further reference to them save in exceptional cases.

Under Surface of the Hind-wings.—In the Constant Broods the ground-colour is generally a slate-grey on which a series of dark spots may be seen with some distinctness; there is in some specimens a trace of a red line within the margin. In the Racial Broods the ground-colour is of a more uniform brown or whitish brown, the black spots are less distinct, and traces of a red line are less common. In those districts where the Racial Broods are much suffused these two types of underside are very constant and distinct. In the north, however, they merge into each other imperceptibly, so that they are not more easily separable on the lower surface than on the upper.

I have generally had the opportunity of examining large captures from one or two localities in each country, and these have been described in full. Usually, however, small numbers from very many different places have also been studied, and it would, of course, be impossible to deal with all these separately. I have therefore grouped them into districts, both for the purpose of a general description as well as of calculating the percentages of the Critical Spot and of the *caeruleo-punctata* form. Where, however, any specimens appear at all remarkable I have also given a separate account of them. Thus the trend of variation can be traced through each country, and can be considered in relation to the description of large collections from a few distinct localities. This plan only holds good for the present section, after which it has been necessary to modify it very considerably.

1. BRITAIN.

Distributed from the Orkney Islands southwards, and throughout Ireland. The distinction between the Constant and Racial Broods, and the effect of the climate on the latter, has already been discussed (pp. 695–697). It is very

rarely that extensively suffused specimens occur, and then of course only in the Racial Brood, which, with us, is the second. Such specimens are naturally more frequent in warm years than in cold ones, but even in the most unfavourable circumstances a few hot days towards the end of the pupal period may have a marked effect. Thus Prof. Poulton captured one specimen on August 14th this year (1923) in the Isle of Wight which is extraordinarily dark, having been affected by the heat during the first fortnight of the month. It is rare to find the tail more than very slightly developed.

The distribution of *Heodes phlaeas* in these islands has been described far more minutely than in any other part of the insect's range. It is not my intention, therefore, to reoccupy a field of work which has been so thoroughly explored. The most elaborate information may be found on this subject in Mr. Tutt's work,* which has previously been cited. I have, however, calculated the percentage in which the Critical Spot is turned in or out in two localities from which a considerable number of specimens have been examined.

Bexley (Kent).

Constant Brood (May to July, those from the latter month are not particularly good specimens). 309 examined. Critical Spot : *out*—156 (50%), *in*—36 (12%). *Caeruleo-punctata*—63 (20%).

Hogley Bog, Bullingdon, Oxford.

Constant Brood. 28 examined. Critical Spot : *out*—13 (46%), *in*—10 (36%). *Caeruleo-punctata*—5 (18%).

Racial Brood. 127 examined. Critical Spot : *out*—56 (44%), *in*—41 (32%). *Caeruleo-punctata*—22 (17%).

2. THE CHANNEL ISLANDS.

Guernsey.

Constant Brood. 11 specimens examined. Critical Spot : 10—*out*, 0—*in*. *Caeruleo-punctata*—9. All are unsuffused, and the ground-colour is very bright. None have tails.

Racial Brood. 4 specimens examined. Critical Spot : 1—*out*, 2—*in*. *Caeruleo-punctata*—4. These are slightly

* "A Natural History of the British Lepidoptera," vol. viii, p. 330 *et seq.*

suffused, and the copper is rather dull; there is a trace of the tail in all.

3. FRANCE.

In the north the species hardly differs from the form to be found in England; in the south the Racial Broods become greatly suffused.

Northern France.

Constant Brood. 7 specimens examined. Critical Spot : 2—out, 3—in. *Caeruleo-punctata*—5. All are quite bright and unsuffused.

Racial Brood. 11 specimens examined. Critical Spot : 0—out, 6—in. *Caeruleo-punctata*—4. There is a trace of the tail, and the copper is dull.

Central France.

Constant Brood. 13 specimens examined. Critical Spot : 6—out, 2—in. *Caeruleo-punctata*—5. All are bright and tailless.

Racial Brood. 24 specimens examined. Critical Spot : 6—out, 15—in. *Caeruleo-punctata*—4. It is here that deeply suffused forms begin to appear, so that the characters of this brood are very unstable—some being coppery, others extremely dark. In a few the tail is well developed.

The Mediterranean Coast.

Constant Brood. 38 examined. Critical Spot : out—24 (63%), in—6 (16%). *Caeruleo-punctata*—11 (29%). In the spring the insects begin to emerge in March. They are generally very small and always bright.

Racial Brood. 58 examined. Critical Spot : out—13 (22%), in—32 (55%). *Caeruleo-punctata*—16 (28%). These are generally very dark, the suffusion being of a rich black shade, and, where copper scales appear, they are very fiery. The tails are long, and the spots on the fore-wings are often much enlarged.

The Pyrenees.

Racial Brood. 17 specimens examined. Critical Spot : 8—out, 4—in. *Caeruleo-punctata*—5. They show very clearly the effect of altitude on *H. phlaeas*. Though one or two specimens are dark, the suffusion is much less than at the same latitude on sea-level; the tails are shorter

and the spots on the fore-wings smaller. For instance, one specimen in Mr. Bethune-Baker's collection captured on Mont Louis, 5,280 ft., 28 vii.-5 viii. 1922, is very bright.

4. SPAIN AND PORTUGAL WITH MAJORCA.

Spain (excepting Segovia and the Gibraltar District).

A few specimens from numerous localities; they do not appear to differ from one another.

Racial Brood. 47 examined. Critical Spot: out—10 (21%), in—21 (45%). *Caeruleo-punctata*—10 (21%). The size seems to vary considerably; all are much suffused and have long tails. The underside of the hind-wings is of a whitish-brown tint.

Segovia (the Sierra de Guadarrama).

Racial Brood. 233 examined. Critical Spot: out—92 (39%), in—66 (28%). *Caeruleo-punctata*—35 (15%). The suffusion is rich and black, its degree varies greatly. Some are quite bright, while, in others, the copper is almost completely obscured. The tails are long. The spots on the fore-wings are large and sometimes meet the marginal band.

Gibraltar and the South Coast (to the Portuguese Boundary).

Constant Brood. Only 7 examined. Critical Spot: 5—out, 1—in. *Caeruleo-punctata*—2. These specimens are very small and bright, the dark markings and spots are pale. This brood begins to emerge at the end of January.

Racial Brood. 16 specimens examined. Critical Spot: 7—out, 6—in. *Caeruleo-punctata*—7. Exceedingly dark and suffused. In a small proportion of the females there is no great amount of black scaling, but they are always large, and the copper is very dull. The underside of the hind-wings is, in all, a whitish brown.

Majorca.

Constant Brood. 2 specimens. Critical Spot: direction doubtful. *Caeruleo-punctata*—1. Very bright and unsuffused, but of considerable size for a Constant Brood.

Racial Brood. 14 examined. Critical Spot: 6—out, 6—in. *Caeruleo-punctata*—6. In spite of the fact that

I have seen one or two dwarfs from the island the specimens are generally rather large and have long tails. The copper is dull and is often heavily suffused.

Portugal. Algarve District.

Constant Brood. 24 examined. Critical Spot: 18—out, 3—in. *Caeruleo-punctata*—2. The colour is bright and tails are practically absent.

Lisbon.

Racial Brood. 5 specimens examined. Critical spot: 0—out, 4—in. *Caeruleo-punctata*—4. The tails are long and the copper is extensively suffused.

5. THE COASTS OF THE BALTIC.

Uddevalla, South Sweden.

Unfortunately the specimens which I have examined from this locality (26 in all) are undated. Almost certainly they are July or August examples: it is probable that two broods occur there. Critical Spot: out—9 (35%), in—5 (19%). *Caeruleo-punctata*—9 (35%). It is singular to find that two are slightly suffused. There is quite a distinct trace of the tail. The underside of the hind-wings is partly overspread with a hoary grey tint in one or two specimens. It is probably beginning to assume the characteristics of one of the far-northern forms to be described later (p. 739).

Russia. Petrograd District.

Racial Brood. Only 3 examined. In all the Critical Spot is turned in. One is of the *caeruleo-punctata* form. The specimens are rather large; in one the copper is slightly dull, though there is no trace of suffusion. The underside of the hind-wings is a greyish brown and the red line is not developed.

Russia. Wolmar.

One specimen, probably July or August, is a very remarkable aberration. The copper is replaced by a dull yellowish-brown shade, and the spots on the fore-wings are greatly reduced. The Critical Spot is practically absent, a very rare occurrence.

Denmark.

Only 5 examined. They belong to a Racial Brood. Critical Spot: 2—out, 2—in. *Caeruleo-punctata*—0. All are rather large and bright.

6. GERMANY, AUSTRIA, AND HUNGARY.

Prussia.

Constant Brood. 4 specimens examined. Critical Spot: 1—out, 1—in. *Caeruleo-punctata*—1. Small and bright.

Racial Brood. 14 specimens. Critical Spot: 6—out, 7—in. *Caeruleo-punctata*—3. The copper is slightly dull. One specimen from Berlin is a beautiful example of ab. *schmidtii* Gerhart, markedly suffused (Plate LIV, fig. 7.).

South-western Germany.

Racial Brood. 16 specimens examined. Critical Spot: 2—out, 6—in. *Caeruleo-punctata*—6. The copper is fiery and in one case deeply suffused.

North-western Austria.

Constant Brood. 22 examined. Critical Spot: 12—out, 3—in. *Caeruleo-punctata*—5.

Racial Brood. 32 examined. Critical Spot: out—10 (30%), in—13 (39%). *Caeruleo-punctata*—6 (18%). In many of these specimens the basal area of the fore-wings is suffused. The tails are long.

Western Hungary.

Constant Brood. 5 specimens examined. Critical Spot: 2—out, 0—in. *Caeruleo-punctata*—2.

Racial Brood. 11 specimens examined. Critical Spot: 4—out, 5—in. *Caeruleo-punctata*—1. Several are very dark, and the tails are generally long.

Bihar Comitatus, Hungary.

Constant Brood. 27 examined. Critical Spot: out—15 (56%), in—4 (15%). *Caeruleo-punctata*—5 (19%). Bright, with the spots on the fore-wings reduced in size. The red band on the upperside of the hind-wings tends to become broad.

Racial Brood. 108 examined. Critical Spot: out—27 (25%), in—49 (45%). *Caeruleo-punctata*—26 (24%). In

these specimens the copper is dull, and many are slightly suffused. Tails are generally present, but short.

7. SWITZERLAND.

None are from far north of the Italian border, and all have been captured from low elevations up to 2,750 ft.

Constant Brood. 7 specimens examined. Critical Spot : 6—out, 0—in. *Caeruleo-punctata*—4. These are small and bright.

Racial Brood. 11 specimens examined. Critical Spot : 4—out, 5—in. *Caeruleo-punctata*—5. A few are considerably suffused; the remainder are rather large, and the copper is dull.

8. ITALY.

The Plain of Lombardy.

Constant Brood. 36 examined. Critical Spot : out—14 (39%), in—5 (14%). *Caeruleo-punctata*—4 (12%). Very bright and fiery.

Racial Brood. 7 specimens examined. Critical Spot : 3—out, 3—in. *Caeruleo-punctata*—5. The copper is dull, and in some specimens suffused. The tail is exceedingly small.

Southern or Peninsular Italy.

Constant Brood. 5 specimens examined. Critical Spot : 2—out, 0—in. *Caeruleo-punctata*—1. Small and bright.

Racial Brood. 48 examined. Critical Spot : out—24 (50%), in—21 (44%). *Caeruleo-punctata*—7 (15%). In this brood the insects are much suffused, their colour being very black and glossy, a small patch of brilliant copper often stands out in the centre of the fore-wing. The tails remain small.

Florence.

Constant Brood. 69 examined. Critical Spot : out—36 (52%), in—24 (35%). *Caeruleo-punctata*—29 (42%). In these broods (from the spring and autumn) the ground-colour is bright and the red band on the upperside of the hind-wings is unusually broad. The spots on the fore-wings are very small.

Racial Brood. 10 examined. Critical Spot : 3—out,

6—*in.* *Caeruleo-punctata*—4. These are exceedingly suffused, the males having practically no copper on the upper surface. A trace of the tail appears.

Elba.

Racial Brood. 5 specimens examined. Critical Spot : 0—*out*, 3—*in.* *Caeruleo-punctata*—2. The males are much suffused, but the only female has no great increase in the black scales, though the copper is very dull. The tails are distinct, though not long.

Corsica.

Racial Brood. 67 examined. Critical Spot : *out*—18 (27%), *in*—40 (60%). *Caeruleo-punctata*—36 (54%). Unfortunately I have seen no Constant Brood specimens from this island. In all cases the copper is fiery and rather dull, often there is extreme suffusion. One rather interesting example in the Hope Department, from a locality near Bocognano, 27 vii. 1911, is quite bright and unsuffused, illustrating the effect of the altitude at which it was captured—2,205 ft.

Sardinia.

Unfortunately I have only seen one specimen from this island. It is of the Racial Brood (though without data). The Critical Spot is turned in and there is a trace of the blue spots. It is exceedingly black and suffused, though the little copper that remains is fiery. The tails are longer than in any specimen I have seen from Italy, Elba, or Corsica.

Sicily.

Constant Brood. Only 11 seen. Critical Spot : 9—*out*, 0—*in.* *Caeruleo-punctata*—5. These are bright and typical in appearance.

Racial Brood. 56 examined. Critical Spot : *out*—32 (57%), *in*—16 (29%). *Caeruleo-punctata*—10 (18%). There is a remarkable development of the tails, which are noticeably longer than in Italian specimens. In the Tring Zoological Museum are ten examples captured above Randazzo, on the slopes of Mt. Etna, at about 3,000 ft. Among them is a dwarf, 24 mm. in expanse; average males being 26–27 mm. in this island. This specimen is suffused and has long tails; indeed, it has all the characteristics of its brood.

9. MALTA.

Constant Brood. Only 2 specimens seen. Critical Spot : both *out*. They are of the *caeruleo-punctata* form. These two insects are small and bright with a very broad band on the upper surface of the hind-wings.

Racial Brood. 12 specimens examined. Critical Spot : 8—*out*, 1—*in*. *Caeruleo-punctata*—0. They are not much suffused, but the copper is rather dull; the tails are long. It is curious to find that such a large percentage of the Racial Brood both in Sicily and Malta have the Critical Spot turned outwards, contrary to the condition obtaining in the neighbouring countries.

10. THE MEDITERRANEAN COAST EAST OF ITALY TO THE LEVANT, WITH THE BALKANS.

Orsova.

Racial Brood. 3 specimens examined. Critical Spot : 0—*out*, 2—*in*. *Caeruleo-punctata*—2. Exceedingly dark and somewhat brown. The tails are long.

Corfu.

Racial Brood. 3 specimens. Critical Spot : 0—*out*, 2—*in*. *Caeruleo-punctata*—0. The suffusion, which is extreme, is of a dull brown colour and the few copper scales are yellow and lack the metallic brilliancy. This is characteristic of the forms east of Italy and is noticeable in an increasing degree as far as Syria, after which Asiatic characters appear. The tails are long.

Greece.

Racial Brood. 36 specimens. Critical Spot : *out*—13 (36%), *in*—12 (33%). *Caeruleo-punctata*—6 (17%). These specimens have very long tails and are deeply suffused.

Salonica.

Constant Brood. 2 specimens. Critical Spot : 1—*out*, 1—*in*. *Caeruleo-punctata*—0. Large but bright and unsuffused; they have no tails.

Bulgaria (Balkans).

Racial Brood. Unfortunately I have seen but one specimen from this country. Critical Spot : *in*. *Caeruleo-*

punctata—0. The tails are vestigial. This insect is considerably suffused, but the remaining copper is pale.

Turkey (Balkans).

Racial Brood. 3 specimens. Critical Spot: all *in*. Deeply suffused; the copper is very yellow and lustreless.

ASIA MINOR.

The South-western Coast.

Racial Brood. 41 examined. Critical Spot: *out*—15 (37%), *in*—23 (56%). *Caeruleo-punctata*—8 (20%). The males are deeply suffused with brown. The band within the outer margin of the hind-wings is narrow but brilliantly red in tone; the tails are very long. The females are comparatively little suffused, the copper is pale and the dark areas and spots brown. The sexes are, thus, strongly dimorphic. (Plate LIV., fig. 18, male.)

Amasia (40° 39' N., 35° 51' E.).

Racial Brood. I have only examined one specimen from this place. The Critical Spot is turned *in*, and there are blue spots on the hind-wings. The specimen is considerably suffused and is much below the average size.

Syria and Palestine.

Constant Brood. 6 specimens examined. Critical Spot: 5—*out*, 1—*in*. *Caeruleo-punctata*—5.

Racial Brood. 25 examined. Critical Spot: *out*—4 (16%), *in*—16 (64%). *Caeruleo-punctata*—10 (40%). Here the difference between the Constant and Racial Broods is most striking. The former are very bright and rather small; the underside of the hind-wings is a greyish brown. The specimens of the Racial Brood, on the other hand, are large, suffused and dull. In the females, particularly, the copper is lustreless and somewhat yellow, giving to the sexes a remarkably distinct appearance. The underside of the hind-wings is a whitish brown. The tails are unusually long.

11. CYPRUS.

Constant Brood. 34 examined. Critical Spot: *out*—19 (56%), *in*—11 (32%). *Caeruleo-punctata*—16 (41%). Very

bright, the spots on the fore-wings are often small. The tail is just indicated.

Racial Brood. 99 examined. Critical Spot: *out*—21 (21%), *in*—65 (66%). *Caeruleo-punctata*—47 (47%). The males are often exceedingly suffused, the females less so. The tails are, I think, consistently longer in this island than anywhere else. The anal angle is elongated into a small projection, and a deep indentation between this and the true tail accentuates both.

Crete.

Racial Brood. Unfortunately I have only examined four from this island. Critical Spot: 2—*in*. *Caeruleo-punctata*—0. In these four specimens the tails are shorter than in the form from Cyprus, which they resemble closely in other respects.

12. THE SOUTHERN COAST OF THE MEDITERRANEAN.

Tunisia.

Racial Brood. 20 examined. Critical Spot: 9—*out*, 7—*in*. *Caeruleo-punctata*—1. The specimens are considerably suffused and the copper which remains is very dull. The tails are long. I have only seen specimens from a few places near the coast.

Algeria.

I have examined a very large number of specimens from this country. In every case the Constant Broods are small, bright and typical in appearance, a tail is just indicated. The Racial Broods are larger; the copper is always dull, but, though suffusion is the rule, it is rarely extensive. The tails are long. The sexes are sufficiently distinct, but they present a marked contrast to the form from the eastern end of the Mediterranean, where they are widely dissimilar, while the extensive suffusion commonly found in males from Syria and Palestine could hardly be paralleled here. A magnificent aberration occurs not infrequently in this area. The spots of the distal series on the fore-wing are continued outwards in broad streaks until they meet the marginal band; the cell-spots are somewhat enlarged, and the whole insect more or less suffused (Plate LIV, fig. 19). I have seen more specimens of this form from Algeria than from the whole of the remainder of the Palaearctic Region.

Dividing the country into four districts I have calculated in each the percentage in which the Critical Spot is turned in and out, and of the *caeruleo-punctata* form, excluding certain localities from which I have seen unusually large numbers. These are dealt with separately.

(1) *The Province of Constantine.*

Constant Brood. 64 examined. Critical Spot : out—42 (66%), in—5 (8%). *Caeruleo-punctata*—23 (36%).

Racial Brood. 24 examined. Critical Spot : 10—out, 6—in. *Caeruleo-punctata*—0.

Batna (considered separately).

Constant Brood. 46 examined. Critical Spot : out—32 (70%), in—2 (4%). *Caeruleo-punctata*—8 (17%).

(2) *The Province of Algeria.*

Constant Brood. 33 examined. Critical Spot : out—24 (73%), in—4 (12%). *Caeruleo-punctata*—2 (6%).

Racial Brood. 50 examined. Critical Spot : out—24 (48%), in—18 (36%). *Caeruleo-punctata*—12 (24%).

Algiers (town and immediate neighbourhood).

Constant Brood. 28 examined. Critical Spot : out—14 (50%), in—2 (7%). *Caeruleo-punctata*—5 (18%).

Racial Brood. 50 examined. Critical Spot : out—18 (36%), in—30 (60%). *Caeruleo-punctata*—6 (12%).

(3) *Southern Algeria.*

Constant Brood. 28 examined. Critical Spot : out—8 (29%), in—6 (21%). *Caeruleo-punctata*—6 (21%). A very remarkable form recalling the Saharan specimens to be described later (p. 719). They are large and bright, while the hind-wings have, on the upperside, a distinct powdering of metallic scales within the copper band.

Racial Brood. Only 17 examined. Critical Spot : 8—out, 7—in. *Caeruleo-punctata*—5. These are dark and are more deeply suffused than most Algerian specimens. The tails are long.

(4) *The Province of Oran.*

Constant Brood. 40 examined. Critical Spot : out—29 (73%), in—2 (5%). *Caeruleo-punctata*—7 (18%).

Racial Brood. 42 examined. Critical Spot: out—19 (45%), in—15 (36%). *Caeruleo-punctata*—2 (5%). This brood is quite typical of Algeria, being very dull but not much suffused. The specimens are large and have long tails.

Ain Sefra.

Constant Brood. 27 examined. Critical Spot: out—14 (52%), in—9 (33%). *Caeruleo-punctata*—4 (15%).

Racial Brood. 13 examined. Critical Spot: 5—out, 6—in. *Caeruleo-punctata*—4.

Sebdou.

Constant Brood. Only 3 examined. Critical Spot: 2—out, 1—in. *Caeruleo-punctata*—1.

Racial Brood. 50 examined. Critical Spot: out—18 (36%), in—24 (48%). *Caeruleo-punctata*—8 (16%).

Afiou.

Constant Brood. 45 examined. Critical Spot: out—36 (80%), in—4 (9%). *Caeruleo-punctata*—10 (22%).

Racial Brood. Only 13 examined. Critical Spot: 6—out, 6—in. *Caeruleo-punctata*—1.

Marocco (Eastern).

Constant Brood. Only 5 examined. Critical Spot: 4—out, none turned definitely in. *Caeruleo-punctata*—2. These are small, bright, typical insects.

Racial Brood. 30 specimens. Critical Spot: out—14 (47%), in—10 (33%). *Caeruleo-punctata*—3 (10%). The specimens are large and their tails are long. The copper is very dull, though there is little suffusion. The black border and spots on the fore-wings are usually large.

13. THE ATLANTIC COAST (TANGIER TO MOGADOR).

Constant Brood. Only 16 examined. Critical Spot: 9—out, 3—in. *Caeruleo-punctata*—7. All are small, bright, and typical in appearance.

Racial Brood. 30 specimens. Critical Spot: out—19 (63%), in—10 (33%). *Caeruleo-punctata*—5 (17%). The specimens are large, with long tails. The copper is often remarkably dull, but suffusion is uncommon. In several examples which I have seen from Tamarouth it has a curious purple tint and is almost lustreless.

14. THE WESTERN BORDER OF THE SAHARA.

El Biar (27° 35' N., 9° 12' W.).

I have seen four specimens from this place.* Two are of the Constant Brood and very typical in appearance. The others are much larger and approach more nearly to the Abyssinian form than any other Palaearctic specimens I have examined. They are quite unsuffused, and the copper inclines towards the brick-dust shade which is so noticeable in *pseudophlaeas*. The hind-wings are thickly dusted with copper scales up to the base, and the band within the outer margin is unusually broad. Indeed, on the upper surface, they would both pass quite well for Abyssinian specimens. Below the resemblance is not maintained, for they have no trace of the deep red-brown ground-colour to be seen on the hind-wings of Ethiopian forms.

From Casba (28° 10' N., 8° 20' W.) I have seen but one specimen; it is of little interest, being a Constant Brood and perfectly typical except that it is well above the average size.

15. THE CANARY ISLANDS.

Here the species is not highly specialized. Considering the remarkable race occurring in Madeira, more striking modifications might well be expected in these islands. Nevertheless the form is not devoid of interest. In both types of brood the spots on the fore-wings, as well as the black margin, tend to become unusually developed; they generally remain definite in outline, and are not surrounded by a slight cloud of dark scales. The copper is wonderfully bright; the brilliance persisting in the Racial Broods even though suffusion—generally slight—may be present. The specimens are large and practically tailless. In the Racial Broods the underside of the hind-wings is a deep blackish brown.

Grand Canary.

Constant Brood. 14 specimens examined. Critical Spot : 12—out, 1—in. *Caeruleo-punctata*—6.

Racial Brood. 6 specimens examined. Critical Spot : 5—out, 1—in. *Caeruleo-punctata*—4.

* For a further account of these specimens see Proc. Ent. Soc. Lond., 1923, pp. xxiv-xxv.

Tenerife.

Constant Brood. 33 specimens examined. Critical Spot :
out—27 (82%), *in*—5 (15%). *Caeruleo-punctata*—12
 (36%).

Racial Brood. 20 specimens. Critical Spot : 14—*out*,
 4—*in*. *Caeruleo-punctata*—12.

I find no difference between the specimens from these two islands.

16. MADEIRA.

Among all the races of *H. phlaeas* there is none more remarkable than that from Madeira, for it shows no special affinity with any known form. It was described by Staudinger as s.-sp. *phlaeoides*, a name over which a considerable amount of confusion has arisen. All authors agree that it is exclusively Madeiran, but there is an impression that it refers only to the specimens which are greatly suffused. Thus Seitz says : * “In the most western form, *phlaeoides* Stgr., from Madeira, the black colour of the hind-wings is so extended that the red submarginal band is hidden. But I found such melanotic specimens also on the Continent, the specimen figured as ‘*eleus*’ and obtained by me near Lisbon is more extended black [*sic*] than all the specimens I caught at Funchal on Madeira.”

Surprise has frequently been expressed that bright unsuffused specimens should appear in this locality, which is notable for producing a race having the fore-wings almost black. The matter is simple when viewed in the light of what has already been said. The unsuffused examples are the Constant Brood which “approximate to the typical form of the species” (p. 696) here as elsewhere, even though it retains one or two features which are characteristic of the island. It only appears in the late autumn and early spring, after which the heat is sufficient to react upon the pupa, and to produce the almost black Racial Brood. Even in specimens from the cooler part of the year the copper has acquired a singular tint, resembling that of a tarnished sovereign. But the latest autumn and earliest spring insects have been subjected to the least heat of all in the pupal stage, and these may be normally bright and fiery.

* “The Macrolepidoptera of the World,” Section I. The Palaearctic Region (translated by Dr. K. Jordan), vol. i, p. 286.

Phlaeoides was originally described from specimens captured on the hills behind Funchal thus :—

“ Alis posterioribus subtus fascia antimarginali dilutiore (cinerea) distincta.” *

It is unfortunate that this description is so condensed and that it omits several extremely interesting features of the race. It does, however, fix upon the most distinctive character of all, and one which occurs to a greater or less extent in 100% of the specimens from this island. The underside of the hind-wings is of a rich brown tint, somewhat mottled; at their base there are a few pale scales, and there is the faintest trace of a red line within the margin. The distinctive feature described by Staudinger consists of a broad, irregular, somewhat elbowed band, of a pale grey tint or even whitish, running beyond the distal row of black dots. It is developed in the brightest of the Constant Brood specimens as well as in the blackest of the Racial Broods, and forms the one true test of *phlaeoides*.

Taking the race as a whole, the specimens are never very large. The tail is quite rudimentary, even in the most suffused examples. In a very high percentage the Critical Spot is turned in. The black colour, whether developed on the hind-wings, in the spots or the marginal border of the fore-wings, or as a suffusion, is of a remarkably intense shade. Not infrequently extra spots appear between the Critical Spot and the base of the wing, a feature peculiarly Madeiran, and only known as one of the rarest aberrations elsewhere. The *caeruleo-punctata* form is not well developed in the island.

Constant Broods. 38 specimens. Critical Spot : *out*—6 (16%), *in*—31 (82%). *Caeruleo-punctata* (usually but little developed) 13 (34%). These insects are generally well below the average size. There is no tail. The copper when not bright, as in a few specimens emerging in the coolest part of the year, has the appearance of tarnished gold. The ground-colour of the underside of the hind-wings is somewhat greyish. (Plate LIV, figs. 1, 20.)

Racial Broods. 29 specimens. Critical Spot : *out*—0, *in*—29 (100%). *Caeruleo-punctata*—5 (17%). The specimens composing this brood are of moderate size with only rudimentary tails. The fore-wings are covered above with

* Staudinger's "Catalogue," 3rd edition (1901), p. 74.

a coal-black suffusion, though the few remaining copper scales are fiery in tint. (Plate LIV, fig. 8—not dark enough.)

Mr. G. T. Bethune-Baker has kindly given me the opportunity of examining his Madeiran specimens, which were captured by Wollaston more than seventy years ago. There is a slight but noticeable difference between these and recent examples. Nearly all the characters of *phlaeoides* are present, but they are less developed in the following particulars: The pale band on the underside of the hind-wings is less noticeable. None have extra spots developed between the Critical Spot and the base of the fore-wing, though this might well be expected among thirty-nine specimens. The blue spots are more pronounced in the *caeruleo-punctata* form. The Constant Brood examples (of which there are fourteen) are larger, and they lack the distinctive colour of tarnished gold, this being the most noticeable alteration of all. In the Racial Broods, to which twenty-five belong, the suffusion is less intense and the tails less reduced.

It is most interesting to find that the lapse of such a comparatively short space of time as seventy or eighty years should have effected an observable change in this form. It seems to suggest that *phlaeas* established itself in Madeira at no very remote period. The question arises, from whence did it come? The three most probable sources of supply are Portugal, the coast of Marocco and the Canary Islands. At first sight it is equally dissimilar from the races inhabiting all three; however, from the foregoing account, it will be seen that the Racial Broods in the two latter localities are but little suffused, being merely large and dull, while in Portugal they are exceedingly dark. To my mind this fact weighs strongly in favour of that country being the place of origin of *phlaeoides*—the blackest of all the western forms.

It should be mentioned that in the Natural History Museum, South Kensington, are two specimens of *phlaeoides* labelled “Palmas, Canary Islands.” Since this form is so exclusively restricted to Madeira, and so dissimilar from that known to occur in the Canaries, it seems highly probable that an error has been made in the locality.

II. A General Account of the Asiatic Forms.

The Asiatic forms of *Heodes phlaeas* are, perhaps, more remarkable than any others. They fall into three groups

of which the first, from Persia, is curiously enough an extreme modification of that found on the Levant.

The second group is the most heterogeneous, and includes the forms from Afghanistan, Bokhara and the surrounding country. These may be greatly suffused, though such a condition is infrequent. The copper is yellow and has lost, to a great extent, even its metallic appearance. All the dark markings and spots on the upper surface are a pale brown. The specimens vary considerably in size, some being quite large. The underside is extraordinarily pale and of a yellowish tint, on which the black spots sometimes show up conspicuously. There is a narrow red line within the margin.

The third group forms a graduated series from the western end of the Celestial Mountains to Japan, where this butterfly reaches its most magnificent development. Specimens from various localities differ in size, in degree of suffusion, and in several other respects, but all are remarkable for possessing a red band within the outer margin of the hind-wing on the underside, and this is characteristic of the Far Eastern *H. phlaeas*. In the Tian-Shan district it is narrow, but in Japan it is broader and far more vivid than the corresponding band in *Chrysophanus dispar* Haw. The sexes are often markedly dimorphic, the female being larger, but much less suffused, than the male. The copper, or that part of it which remains, is always bright and fiery and the dark markings and spots are of a very intense black, thus presenting the greatest possible contrast to the specimens from Afghanistan. The tails are absent or extremely short.

Tutt has made a summary of the described Asiatic forms,* which are four in number, though several other aberrations have also received names. The localities in which these occur are by no means clearly defined, nor are the descriptions as full as could be wished. I will, however, quote his remarks on the first three of them before dealing with the Asiatic localities in greater detail. The fourth, *chinensis* Felder, will be considered later.

“a. var. *turanica* Rühl.” . . . “An intermediate race between the typical form and var. *eleus*; the upperside only slightly darkened; the underside very pale. Tura (Rühl).”

* “A Natural History of the British Lepidoptera,” vol. viii, pp. 349–350.

"*β. var. oxiana* Gr.-Gr." . . . "In the month of May *phlaeas* is found everywhere in the Pamirs, but not beyond 4,000 ft. In the month of August, the second generation is on the wing; this, however, cannot be referred to *eleus*, because, although 'supra nigri-eans,' it is not 'caudata.' Besides, as far as I recollect, it is a transition to the form of *phlaeas* from Bokhara, which I describe as *oxiana* Gr.-Gr.; and which differs from the type (1) by the very dark coloration of the wings of the males above; (2) by the very pale coloration of the whole under surface of the hind-wings. Kabadian in mid-May (Grum-Grshimailo)."

"*γ. var. comedarum* Grum.-Grsh., 'Rom. Mém.' iv, p. 365 (1890); Rühl, 'Pal. Gross-Sehmett,' p. 747 (1896); Tutt, 'Brit. Butts.,' p. 154 (1896). The form which I have reported from the south-east of the Kounjout Mountains approaches the var. *oxiana* very closely. Unfortunately I have only a single female, on which it is difficult to establish a new variety. Its distinctive characters are: (1) the largest example of *phlaeas* in my collection is 31 mm., whilst the form which I here describe is 36 mm. (2) The coloration above is very pale. (3) The coloration of the underside is paler than in *oxiana*, all the spots are very large and particularly strongly developed on the hind-wings. In case this form should be found constant I propose to call it *comedarum*. Taken on Col Beik, at 14,000 ft. elevation, in mid-July (Grum-Grshimailo)."

From the above description of *comedarum*, Tutt makes it perfectly plain that he names the form himself, yet here, and at another passage in the same work (p. 340) he attributes the name to Grum-Grshimailo.

17. MESOPOTAMIA.

Unfortunately I have seen very few specimens from this country. The scarlet band on the underside of the hind-wings, so characteristic of Eastern Asia, first appears here. How far it is a constant feature I cannot say, but it is certainly present, though very narrow, in one or two specimens from Babylon. These are rather small and bright, with but little suffusion, though they were captured during the first week of June. It is rather singular to find this character in a locality which seems, in a measure, cut off from the area where it is a prominent feature.

18. PERSIA.

Racial Brood. 14 specimens examined. Critical Spot: 4—out, 7—in. *Caeruleo-punctata*—5. These are greatly

suffused with a dull brownish shade, so that in one or two males only slight copper reflections remain, and these are of a yellowish tint. The metallic band on the hind-wings is distinctly red. On the under surface these specimens do not resemble any Asiatic form, the hind-wings being unicolorous brown as in Southern-European examples. The tails are very long.

I have only seen a single specimen belonging to a Constant Brood. It is quite unsuffused and the Critical Spot is turned out. The under surface of the hind-wing has a red band, though its colour is very pale. The presence of this band in a form which is by no means typically Asiatic is most interesting, suggesting that the character is just beginning to appear, and it would be very desirable to ascertain the proportion of the individuals possessing it. Its appearance in two Mesopotamian specimens is equally suggestive (p. 724).

19. AFGHANISTAN.

Racial Brood. 15 examined. Critical Spot: 3—out, 12—in. *Caeruleo-punctata*—9. The majority that I have seen from this country appear to be var. *comedarum*. They are often of a very large size; the upper surface is pale, for the copper is yellowish and the dark markings brown. The spots on the fore-wings are often extended as wedge-shaped, dark clouds towards the base of the wings. The underside of the hind-wings is also very pale, being somewhat yellow, with the black spots and lunules very conspicuous. Here the red band is persistent in all the specimens, though it is very narrow. In two examples similar in other respects the fore-wings are heavily suffused above, and one has long tails.

20. TIBET.

The form which occurs in this country is considered here because it seems to be more nearly related to that from Afghanistan than to any other Palaearctic Race. Naturally the material is very difficult to obtain, and I have seen only the specimens (15 in number) which were brought back by the Tibet expedition of 1904. Since all of them are alike, and are different from any other known form, they may be considered to constitute a local race which I propose to describe as s.-sp. *flavens*.

Somewhat above the average size and without tails. The upper surface is very pale, the copper being yellowish and the dark markings rather brown. There is but little suffusion. The Critical Spot is turned out in 14, its direction is doubtful in one of the 15 specimens examined. None are of the *caeruleo-punctata* form. The spots on the fore-wings are unusually large. In every case the hind-wings below are unicolorous and of a lemon-yellow colour unparalleled in this species. There is an indication of a red line within the outer margin. Described from eight specimens captured at Gyantse (13,000 ft.) vi.1904, six from Lhasa 21. ix.1904, of which one is the type, and one from Chaksam, Brahmaputra Valley (12,000 ft.), all in the Natural History Museum, South Kensington.

If sufficient material could be obtained specimens with the Critical Spot turned in might be found, but the proportion in which this occurs is probably very small: the *caeruleo-punctata* form might likewise appear in small numbers. The variety is based, however, on the colour of the underside of the hind-wings, which is unique.

21. THE TIAN-SHAN DISTRICT.

The form characteristic of the Far East may be said to begin at this point, for on the under surface of the hind-wings a red band is constantly present within the outer margin. Nevertheless, the insects from the Tian-Shan form an isolated and distinct race, which has not hitherto been described. I propose for them the sub-specific name *coccineus*.

Of moderate size, 28–32 mm.,* and without tails. The copper highly metallic and of a definitely red, almost scarlet, tone; the band on the hind-wings is unusually broad. Suffusion only occurs in the most exceptional cases and then is but slight. The dark markings (*i.e.* the ground-colour of the hind-wings and the spots and outer margin on the fore-wings) are intensely black. On the under surface the colour of the hind-wings is a pale grey with a yellow lustre and the black dots upon it are often very distinct: within the outer margin is a somewhat faint red band. *Habitat* :—The Tian-Shan, extending westwards to the Susamyr-tau (a spur of the Celestial Mountains) and northwards to the shores of Lake Issyk-kul. Type in the Hope Department, University Museum, Oxford.

* Calculated by measuring the distance from the centre of the body to the tip of one fore-wing and doubling this amount.

I have examined sixty-three specimens captured in different years in this district and have not found an exception to the above description. It seems definitely, therefore, to be a local race. I have seen one ab. *schmidtii* Gerhart, from the Turgan Ak-su Pass; in this specimen the copper is replaced by a pale straw colour, although otherwise the insect agrees perfectly with s.-sp. *coccineus*. No greater contrast to the Afghanistan specimens could be imagined than this brilliant form. It differs from *chinensis* (see below) in the following particulars. It is smaller, the copper is more fiery, the red metallic band on the upperside of the hind-wings is broader, while in *chinensis* it is narrower, than in the typical form. On the lower surface the band within the outer margin is narrower and a very pale pink instead of a vivid scarlet. (Plate LIV. figs 3, 4.)

All the specimens I have examined have been captured in July or August. They must therefore be a Racial Brood. Critical Spot: *out*—27 (43%), *in*—12 (19%). *Caeruleo-punctata*—28 (44%). Here we find a further distinction from *chinensis*, for, in the Racial Broods of that form, the Critical Spot is never turned out.

It has been pointed out previously that the Critical Spot may be divided into two. Where this occurs the two portions nearly always slant inwards towards each other: that is to say, if it were completed the spot would be turned out. In *coccineus* the specimens having these broken, outwardly turned spots are very numerous: far more so than in any other form. I have, therefore, calculated the proportion in which they occur separately, the result being 30%. Were they included with the outwardly turned spots the proportion would be raised from 43% to 73%.

22. CHINA.

The form occurring in this country is s.-sp. *chinensis* Felder, of which the characteristics are as follows:—

Racial Broods.—The specimens may be very large (up to 36 mm.); the tails are rudimentary or absent. On the upper surface the copper is very bright, though not so red as in var. *coccineus*. The spots on the fore-wings are abnormally large; suffusion may be extensive in some localities, but more generally it is entirely absent. The copper band within the outer margin of the hind-wings is narrow. On the under surface the ground-colour of the hind-wings

is pale grey, on which the black spots show up very distinctly. In nearly all specimens it is powdered with yellow scales which can always be seen if looked at from an angle, but are generally quite obvious. Within the outer margin is a broad band the colour of red lead. In the Racial Broods the Critical Spot is never turned out (in a very few its direction is doubtful, being hour-glass shaped) and blue spots are never developed; this at least was true in the forty-nine specimens examined from various parts of the country.

Constant Broods.—The specimens differ from the above description in that they are smaller, brighter, and unsuffused. The Critical Spot may turn in either direction, but most frequently outwards.

Constant Brood. 28 examined. Critical Spot: out—20 (71%), in—4 (14%). *Caeruleo-punctata*—0.

Racial Brood. 56 examined. Critical Spot: out—0, in—52 (93%). *Caeruleo-punctata*—0.

The species is widely distributed throughout the country and extends from Western China to the Chusan Islands. (Plate LIV, figs. 10, 11.)

23. NORTHERN MANCHURIA AND SOUTH-EASTERN SIBERIA.

Little Khingan Mountains (immediately south of the Amur River).

Constant Brood. 2 specimens. Critical Spot: both out. These are small and typical in appearance. The underside of the hind-wings is pale grey with a very bright submarginal red line.

Racial Brood. 4 specimens. Critical Spot: 2—out, 1—in. These insects are larger. The underside of the hind-wings is a pale grey colour with a brilliant red submarginal band; there is a slight dusting of yellow scales over their entire surface.

Apfelgebirge (Transbaikalia).

Racial Brood? (June). 3 specimens. Critical Spot: 2—out, 1—divided. Bright and unsuffused above. The under surface of the hind-wings is grey, the black spots are very pronounced; the red submarginal line is narrower than in *chinensis*, though it is very bright.

The specimens from both the above localities are smaller than *chinensis*, from which they differ also in the broader

red band on the upperside of the hind-wings, and the narrower one below. The Critical Spot may be turned out in the Racial Brood; on the other hand none are of the *caeruleo-punctata* form. They provide, in the order given, most valuable links between the Eastern-Asiatic race and *hypophlaeas* (see pp. 735-738, 740-743).

24. JAPAN.

In this country *H. phlaeas* reaches its finest development. At first sight it appears to be the same form as that which occurs in China (i.e. *chinensis*). This, however, is not the case. Small but constant differences may be found, so that it would be an easy matter to separate correctly a number of unlabelled specimens from the two countries. This does not appear to be recognised. The Japanese form has been largely ignored or included in the race *chinensis*, to which it is closely related. Since it is a perfectly distinct local form it is well worth describing. I propose for it the name *japonica*.

Similar to *chinensis* in its general appearance but to be distinguished from that form by the following characters. Suffusion is much more frequent and extreme. In the Racial Broods the fore-wings of the males are frequently quite black: the sexes consequently are markedly dimorphic. The Critical Spot may be turned either out or in, and blue spots are not uncommon. The spots on the fore-wings are smaller. On the underside, the hind-wings are a much darker grey, so that the black spots are less obvious, the dusting of yellow scales which is usually such a noticeable feature in *chinensis* is entirely absent in *japonica*, while the scarlet band is slightly broader and, being on a darker ground, appears more brilliant. The type is in the Tring Zoological Museum.

These characteristics of the underside of the hind-wings hold good in Constant and Racial Broods alike, while in the latter the difference in the degree of suffusion, and in the Critical Spot, afford additional evidence that they are distinct. One form from Japan has already been named. This is ab. *daimio*, which Seitz introduces in the following words *:—"A gigantic form is found in Japan, but only in the summer and autumn, which, in addition to the large

* "The Macrolepidoptera of the World," Section 1. The Palaearctic Region (translated by Dr. K. Jordan), vol. i, p. 286.

prominent black markings and the red band on the under-side of the hind-wing, may bear a row of bluish-white dots before the outer third of the upperside of the hind-wing. This form I caught myself in Japan, where I obtained it also from collectors under the name of ab. *daimio*, which may be accepted for it." This name appears, then, to be applied to *caeruleo-punctata* when it occurs in large dark specimens of the Racial Brood from Japan. It is the finest development to which *phlaeas* has attained. *Japonica*, on the other hand, includes all Japanese specimens, whether of a Constant or a Racial Brood. (Plate LIV, fig. 2 ♂, 9 ♀ ab. *daimio*, 16 ♀ underside, the type.)

Constant Brood. 78 examined. Critical Spot : out—64 (82%), in—4 (5%). *Caeruleo-punctata*—38 (49%).

Racial Brood. 97 examined. Critical Spot : out—18 (19%), in—60 (62%). *Caeruleo-punctata*—27 (28%).

The proportions have been calculated separately in an extensive series from two localities not included above :—

Yokohama.

Constant Brood. 28 examined. Critical Spot : out—22 (79%), in—2 (7%). *Caeruleo-punctata*—16 (57%).

Racial Brood. 32 examined. Critical Spot : out—8 (25%), in—18 (56%). *Caeruleo-punctata*—6 (19%).

Tokio.

Constant Brood. 26 examined. Critical Spot : out—24 (92%), in—1 (4%). *Caeruleo-punctata*—15 (58%).

Racial Brood. Only 8 examined. Critical Spot : 1—out, 6—in. *Caeruleo-punctata*—2.

25. COREA.

The form from Corea is curious, at least in the Racial Broods; the Constant Broods I have not seen. The specimens are exceedingly suffused but resemble *chinensis* except that the copper which remains, instead of being fiery, is yellowish and lustreless. On the under surface the hind-wings are in a condition intermediate between *chinensis* and *japonica*. Their ground-colour is a dark grey as in the latter, and they have a dusting of yellow scales as in the former. There is, of course, a scarlet band within the outer margin.

Gensen.

Racial Brood. Only fourteen examined. Critical Spot: 1—out, 11—in. No blue spots are present. It will be noticed that they further resemble *japonica* in that the Critical Spot is not always turned in.

III. Some Conclusions regarding the Palaearctic Races.

In the foregoing account of the variations of *Heodes phlaeas* in the Palaearctic Region, several points have arisen to which I desire to draw attention. A number of areas may be recognised in which the species varies in a definite way. In Northern Europe the broods differ but little from one another, so that almost all the specimens are small and bright. Along the north coast of the Mediterranean as far east as Italy the Racial Broods are very dark, for the copper is usually obscured by a glossy black suffusion, though, where it remains, it is bright and fiery. The tails are long. From hence to the Levant the specimens become progressively duller, and the copper yellower and less metallic in appearance. The tails become longer and the sexes more completely dimorphic. From Tunisia westwards suffusion becomes gradually a less prominent feature, and the tails are reduced. The Constant and Racial Broods remain, however, as distinct as before, owing to the dulness of the copper in the latter.

In Asia the forms are unstable as far east as Persia. A large pale race inhabits Afghanistan and the surrounding country, while from the Tian-Shan Mountains a magnificent form becomes progressively developed until it reaches Japan. This race is distinguished by possessing within the outer margin of the hind-wings below, a conspicuous red band which is characteristic of the Far Eastern forms of *H. phlaeas*. It is only occasionally indicated in European specimens and it may be slightly developed as an aberration elsewhere. I have seen one or two examples of a Constant Brood from Grand Canary in which this was the case. The length of the tail is generally correlated with the amount of suffusion: this is usually true of the European, but not of the Asiatic forms.

An examination of the Critical Spot leaves no doubt that it is turned outwards much more frequently in the Constant than in the Racial Broods, and inwards much more frequently in Racial than in Constant ones. I have

selected, from the foregoing data, eight localities from which large numbers of insects have been examined, in order to demonstrate this point.

Locality.	Critical Spot, out.		Critical Spot, in.	
	Constant Brood.	Racial Brood.	Constant Brood.	Racial Brood.
France (Mediterranean Coast)	63%	22%	16%	55%
Bihar Comitat (Hungary).	56%	25%	15%	45%
Cyprus . . .	56%	21%	32%	66%
Algiers (Town) .	50%	36%	7%	60%
Oran (Province) .	73%	45%	5%	36%
Madeira . . .	16%	0	82%	100%
China . . .	71%	0	14%	93%
Japan . . .	82%	19%	5%	62%

It will be seen that in no single case do the figures in the second column amount to as much as the corresponding ones in the first, and, conversely, that those in the third column never amount to as much as the corresponding ones in the fourth. Also that, in every column, the numbers are very nearly the same in three or four cases, but in one or two localities entirely different proportions appear, proving that the Critical Spot is a character which varies racially.

F. THE ORIENTAL REGION.

1. General Remarks.

The Oriental Region does not include an important part of the range of *Heodes phlaeas*. The species only occurs in Northern India and never far south of the Himalayas. The insects are of moderate size; tails are well developed in one form (s.-sp. *timeus* Cramer, see pp. 733-734), otherwise they are absent or quite rudimentary. The underside of the hind-wings is grey or brown, generally with a yellowish tone; within the outer margin a red line is somewhat feebly developed. On the upper surface the fore-wings may be entirely black, but the copper when it remains is fiery. Nowhere else are specimens of this kind found with the type of underside described above, so that they are quite characteristic of India. More frequently there is

little or no suffusion. The Oriental origin of such examples is usually very obvious, for in them the copper is rarely bright but has a curious yellowish-grey tint which is unmistakable. (Plate LIV. figs 15, 17.)

Deeply suffused Forms. 32 examined. Critical Spot : out—10 (31%), in—18 (56%). *Caeruleo-punctata*—20 (63%).

Unsuffused Forms. 36 examined. Critical Spot : out—32 (89%), in—4 (11%). *Caeruleo-punctata*—20 (56%).

Goorais Valley (Kashmir).

I have examined sixty specimens from this locality. There is a good deal of suffusion in some, but not of the most extreme character. The uppersides have generally rather a yellow appearance. Critical Spot : out—42 (70%), in—6 (10%). *Caeruleo-punctata* 34 (57%).

In the Oriental Region the division of broods into the Constant and Racial type is of little value, though these still appear with reduced differences. The temperature is sufficient, even in the coolest part of the year, to produce the characteristics of the Race. It will be seen from the above data that the *caeruleo-punctata* form is unusually frequent and it is often very highly developed. Suffusion seems largely to depend on the rainfall and consequent luxuriance of the vegetation.*

2. The three named Forms.

Three Indian forms have received names :—

(1) s.-sp. *timeus* Cramer, "Pap. Ex.," vol. 2, p. 137, pl. elxxxvi, figs. E, F (1777). "The red colour of the upperside of the wings, and the dirty yellow ground-colour on the underside of the forewings, are shining, exactly as that of *P. virgaureae* and *P. phlaeas*, there being much resemblance between the last named and that we figure. It belongs, like the others, to the 'Argus' group (*Papilio Plebeius Ruralis*). It was taken in Smyrna." †

Cramer was under the impression that this was a new species. It is curious that the name was first given to an aberration from Smyrna which becomes racial in India.

* See de Nicéville, "Butterflies of India," vol. iii, p. 317.

† See Tutt, "A Natural History of the British Lepidoptera," vol. viii, p. 350.

De Nicéville ("Butts. of India," vol. iii, pp. 315-316) describes it in greater detail as follows:—

"♂ ♀, 1.3 ins.-1.7 ins. ♂, larger than the typical form; upper-side of fore-wing very much darker, the coppery colour almost entirely overlaid with blackish; the black spots larger; otherwise as in the typical form. ♀, larger; upperside of fore-wing with the lower basal area thickly overlaid with blackish scales, having the apical and outer portions alone of the coppery ground-colour quite clear. Hind-wing with the discal blue spots often very large and prominent, otherwise as in the typical form."

(2) s.-sp. *stygianus* Butler, "Proc. Zool. Soc. Lond.," p. 408, pl. xxxix, fig. 5 (1880). "♂, smoky-brown; the primaries in certain lights shot with fiery copper; spotted with black as in *C. timeus* (? *eleus* Fabr.); two small orange spots beyond the interrupted black discal series; the hind-wings with a slender, undulated, deep, reddish-orange band on a black ground near the outer margin; above it a series of four or five pale blue hastate spots, and above these again, beyond the end of the cell, two black dots; a black dash at the end of the cell; fringes greyish white; body blackish. Wings below, very like *C. timeus*, but considerably paler, the sub-marginal black spots of primaries less distinctly white-bordered; the apex and outer margin of primaries, and the ground-colour of the secondaries, very pale grey. Expanse of wings 1 in. 4 lin. The ♀ larger than the ♂; the primaries, with the outer third of the cell, and the subapical area, bright orange; the black spots larger, otherwise similar; below slightly yellower in tint all over, so that the ground-colour of the secondaries has a pale brownish, rather than greyish, hue; expanse of wings, 1 in. 5 lin. "Common in April and May, abundant in June. This insect is considerably larger than *C. phlaeas*, and has the costal margin of the primaries longer."

(3) s.-sp.? *baralacha* Moore, "Journ. As. Soc. Beng.," vol. liii, p. 25, pt. 2 (1884). "Expanse 1.37 ins. ♀. Differs from specimens of the same sex of *phlaeas* var. *stygianus* Butl., taken in the neighbouring country of Lahoul. Upperside of fore-wing golden yellow, with a blackish quadrate spot in the middle of the cell, a larger spot at its end; three oblique subapical spots, and three lower discal spots, the lowest spot being the longest and curved; from the three subapical spots some black freckles proceed to the discocellular spot; the costal edge is very narrowly bordered with brown, and the exterior margin has a narrow macular brown border of half the width of that of the above-mentioned species. Hind-wing golden greyish brown, with a broad, pale red, outer marginal band, which is very slightly indented with black at the end of the veins on its

outer border, and, on the inner border by a row of distinct blackish spots, and a black lunule at the end of the cell. The underside of similar colour to that of the above species; fore-wing with the spots as on the upperside, but pale bordered, also a spot at the base of the cell, two small spots on the costa above the distal series, and three linear spots on the exterior margin above the angle, these latter spots being near the margin, hind-wing with less defined, red-streaked marginal band, the discal and other spots also comparatively larger. Baralacha Pass, 16,060 ft., Ladak, taken July 1879, by de Nicéville."

De Nicéville ("Butts. of India," vol. iii, p. 317) remarks that "the type (and only known specimen) of this local race is in the Indian Museum, Calcutta. . . ." The wisdom of naming forms from a single specimen seems to me somewhat questionable. S.-sp.? *baralacha* may well be a local race, but I cannot see that we have any guarantee that this is so, or indeed that it is anything but a chance aberration.

G. THE NEARCTIC REGION.

1. *H. phlaeas hypophlaeas* described; its Characteristics.

Heodes phlaeas occurs throughout the greater part of the Nearctic Region, from Ellesmere Land in the north to California and Texas in the south. With one exception (s.-sp. *felderi* McLach., see pp. 738-739), the whole of this great area is inhabited by a single race, a condition unparalleled elsewhere in the range of the species. It has been known variously as *hypophlaeas* Bdv., "Ann. Soc. Ent. Fr.," 2nd series, vol. x, p. 291 (1852); *americanus* D'Urb., "Can. Nat.," vol. v, p. 246 (1860); and *americana* Harr., "Ins. Inj. Veg.," 3rd ed. pp. 273-274, fig. 104 (1862). The name *hypophlaeas* therefore stands as the oldest. Boisduval's description is as follows:—

"Très voisin de notre *phlaeas*, mais plus petit, avec les points plus marquées, les ailes plus arrondies; le dessous des ailes inférieures d'un cendré-blanchâtre, avec la bande fauve marginale bien marquée. Nord de la Californie. Il se retrouve dans tout le nord des Etats-Unis."

Little of importance can be added to this short but excellent summary of the characteristics of the Nearctic form. On the upperside *hypophlaeas* is very similar to certain small specimens of the Constant Brood from the

Palearctic Region, save that the markings are perhaps even more definite, and the copper brighter. Only the smallest vestige of a tail is found, and that but seldom. The under surface of the hind-wings is truly remarkable. The paleness of the grey or brownish ground-colour causes the black spots and lunules to show up with great distinctness, but the most conspicuous feature is the bright red band within the outer margin. Occasional aberrations are as frequent in this race as they are elsewhere. It is to this that Tutt refers in the following passage : * " The North-American race of this species has been variously known as *hypophlaeas* and *americana*, and appears to be, on the whole, little less variable than the Palearctic insect. No form so white as our ab. *alba*, usually, but erroneously, called *schmidtii*, has yet been taken there, but an approach to our ab. *intermedia* is found in the *fulliolus* of Hulst, while two of our best-known European forms, ab. *obliterata* and ab. *fasciata*, were first described from American specimens." An example of *hypophlaeas* ab. *alba* is figured on Plate LIV, fig. 13 (Tring Zoological Museum). The two European forms, to which Tutt alludes as being named from American specimens, were described originally as follows :—

(1) ab. *obliterata* Scudd., " Butts. New Engl.," vol. ii, p. 1001 (1889). " There is a partial and nearly complete obliteration of the extra-mesial spots of the front wing, both above and below."

(2) ab. *fasciata* Streck., " Cat. Amer. Macro-Lep.," p. 101 (1878). " In the row of spots in the middle of the outer half of the wing, each spot, though perfectly distinct from the others, is expanded a very little exteriorly, and very much interiorly; the spots beyond the cell joining that which borders the outer limits of the same; those in the median interspaces extending nearly or quite to the base of the interspaces, and that of the medio-submedian interspace is, in one instance, as long as broad, and in the other twice as long as broad, instead of being, as normally, half as long as broad. On the under surface, the wings have the normal pattern."

One aberration (*fulliolus* Hulst) seems to be restricted to *hypophlaeas*. It was described as follows :—

Hulst, " Ent. Amer.," vol. ii, p. 182 (1886). " *C. americanus* var. *fulliolus*, nov. var. A variety of this common species in which the

* " A Natural History of the British Lepidoptera," vol. viii, pp. 341-342.

coppery-red is replaced by an equally glowing somewhat sooty-yellow."

2. *Constant and Racial Broods : a Summary of the Race.*

The distinction between Constant and Racial Broods in the Nearctic Region is somewhat uncertain. The former are always of the type previously described, as are the latter in the great majority of cases. A certain amount of suffusion is sometimes present in the Racial Brood, but this is not correlated with any of the features usually associated with it elsewhere. The size is not increased and the copper which remains is bright and metallic, while tails are never developed beyond the merest vestige. The underside of the hind-wings is occasionally of a darkish brown, so that the black spots are less obvious. The red band within the outer margin is usually present, but in exceptional instances even this may almost be lost.

Owing to the uniformity of American specimens and the difficulty of determining to which type of brood undated examples belong, I have calculated the percentage in which the Critical Spot is turned out and in and of the *caeruleo-punctata* form for all the Nearctic specimens examined in detail. An exception has, however, been made in favour of a series from Montreal in Mr. G. T. Bethune-Baker's collection, which shows the characteristics of the Racial Brood in a most remarkable degree, and is therefore considered separately.

Canada and the United States.

85 examined. Critical Spot: out—34 (40%), in—29 (34%). *Caeruleo-punctata*—19 (22%).

Montreal.

Constant Brood. 2 specimens examined. Critical Spot: 1—out, 1—in. *Caeruleo-punctata*—0.

Racial Brood. 8 specimens. Critical Spot: 3—out, 4—in. *Caeruleo-punctata*—1. In these the underside of the hind-wing is brown, and in one or two the red band is almost absent.

There has been, in the past, a considerable amount of controversy as to whether *hypophlaeas* is, or is not, a species distinct from *phlaeas*. The late Dr. Chapman's report on their genitalia (see p. 704) affords adequate proof that the

two are specifically identical. It may be mentioned, in addition, that the two forms show the closest similarity throughout their life-history, that there are races more or less intermediate between them (see pp. 728-729), and that *hypophlaeas* is also found in the extreme north of the Palaearctic Region.

H. THE CIRCUMPOLAR FORMS.

Two forms of *Heodes phlaeas* occurring in the Far North have been described.

(1) *Hypophlaeas* Bdv. This has been dealt with in the preceding section. Not only does it occur throughout the Nearctic Region, but it has an extended range in Arctic Europe and Asia. There is a specimen from Siberia in the Hill Museum, Witley, and two from Amurland in the Natural History Museum, South Kensington, while Staudinger also refers to specimens from the latter country. There can be little doubt that this form will ultimately be found distributed along the north coast of Asiatic and European Russia, for it is known to occur in Lapland; there is a specimen from this locality in the Tring Zoological Museum (Plate LIV, fig. 21), another in the Hill Museum, together with one labelled "Norway," which, though it has no other data, must almost certainly have come from the extreme north-east of that country. For the numerous examples labelled *hypophlaeas* in collections from Norway, see p. 739-740.

(2) s.-sp. *fieldeni* McLachlan, "Journ. Linn. Soc.," vol. xiv, p. 111 (1878). "28 mm.-29 mm.; differs from typical *phlaeas* (and also from *americanus*) in the brilliant copper colour of the anterior wings being much less fiery and more subdued and with brassy reflections (especially in the ♂), so that the colour might almost be termed brassy rather than coppery; the spots normal in number and position, but smaller; the dark border narrow and silky greyish-black with grey fringe, the dark costal margin scarcely indicated; on the posterior wings the ground-colour is of the same silky greyish black as in the border of the anterior, the pale submarginal band pale orange, with occasionally the faintest indication of bluish spots upon it. Beneath the anterior wings are greyish orange (with the ordinary spots), the border and the posterior wings pale cinereous; on the latter wings, the dark dots are very faintly indicated, and there is also only the faintest indication of the red submarginal band. Three examples (two ♂, one ♀) from lat. 81° 45'."

These three insects, now in the Natural History Museum, are among the most interesting butterflies in the world, since they were captured (with four other species) in Grinnell Land, at the highest latitude at which *Rhopalocera* have so far been obtained—more than halfway to the Pole from the Arctic Circle. The Critical Spot is turned inwards in all three.

There is, in addition to these, a third Arctic form, which, though it is perfectly distinct in appearance and, I believe, in origin, and though specimens of it are not infrequent in collections, has never been separated from *hypophlaeas*. I propose to describe it as the race *hyperborea*.

Noticeably larger than *hypophlaeas*. The length of one fore-wing varies from 13.5–14 mm., while in the latter form the average seems to be from 12.5–13 mm. Above, the copper is somewhat brassy. The underside of the hind-wing is a beautiful blue grey, somewhat mottled, on which the black spots and lunules stand out very distinctly. It makes a striking contrast to the pale grey, brown, or drab colour of these wings in *hypophlaeas*. There is only an indication of the red submarginal line, but the trace of it is rather more obvious than in European specimens, owing to the very pale ground on which it is set. This evanescent line itself is distinctly dark and brownish, and could never be mistaken for the scarlet submarginal band of the Neartic form.

Habitat: Arctic Norway and Lapland. It is not found in Siberia or North America. The type specimen (Plate LIV, fig. 14) is in the Hope Department of the University Museum, Oxford. It was captured at Alten, August 1906, by the late Mr. H. Rowland-Brown.

Twelve examples. The Critical Spot: 4—out, 6—in.
Caeruleo-punctata—4.

Specimens of *hyperborea* are far more frequent in collections than are Palaearctic examples of *hypophlaeas*. Owing to the presence of this unrecognised form, some confusion exists in the literature dealing with the Far Northern races of *phlaeas*. For example Tutt remarks: * “He [Sparre-Schneider] thinks that *R. phlaeas* reaches its finest and largest development in the northern areas of its distribution, *e. g.*, the largest ♂ from Tromsø measured 28 mm., an expanse greater than that of his examples from Central and Southern Europe.” On the other hand,

* “A Natural History of the British Lepidoptera,” vol. viii, p. 342.

Boisduval's original description of *hypophlaeas* commences with the words, "Très voisin de notre *phlaeas*, mais plus petit . . .," and anyone acquainted with the Nearctic form of the species will agree with him. Sparre-Schneider was, of course, perfectly correct in his observations, but, writing in the Tromsø Mus. Aarsheft., vol. xv, p. 20, he was referring to *hyperborea*.

These two forms are represented on Plate LIV, so that they can be compared. Figs. 6, 14 (an upperside and underside, being a co-type and the type) represent *hyperborea* from Norway. Fig. 21 (an underside) represents *hypophlaeas* from "Lapland" (probably the country to the west of the White Sea), and figs. 5, 12 (an upperside and underside) *hypophlaeas* from the Nearctic Region.

I. THE ORIGIN OF HEODES PHLAEAS HYPOPHLAEAS.

It is sufficiently obvious, from geographical considerations, that *H. phlaeas* must have populated the Nearctic Region from Asia. The distance by sea from North-Eastern Siberia to Alaska, by way of the "stepping-stones" of the Aleutian Islands, is very short compared with the great stretches of water which separate Europe from North America. The fact that no single species of butterfly has succeeded in establishing itself in Iceland * shows clearly enough the difficulty of crossing the North Atlantic. On the other hand, the high latitude of the Bering Sea could be no obstacle to a species which can maintain itself in Grinnell Land (see pp. 738-739).

A certain amount of evidence on this point may, however, be obtained from the specimens themselves. The forms of *phlaeas* inhabiting Eastern Asia differ in many respects, but they have one feature which is absolutely characteristic, viz. the scarlet submarginal band on the underside of the hind-wings. As migrations took place northwards, the insects which established themselves near the Amur River and in Southern and, finally, Northern Siberia, became affected by the lower temperature. They were reduced in size, and the feature most characteristic of warmth—suffusion—disappeared. The result was the production of a small bright butterfly, displaying local variation in the drab colour of the underside of its hind-wings, but retaining

* See Commander J. J. Walker, "Ent. Mo. Mag," vol. lviii, pp. 1-7 (1922).

the scarlet submarginal band characteristic of the district from which it came—in fact, *hypophlaeas*. The stages in this change may be studied to-day in specimens from the extreme north of Manchuria and the south of Siberia (pp. 728–729). There is reason to suppose that these *hypophlaeas*, populating North-Eastern Siberia, and resulting from a migration northwards from Eastern China, spread in two directions. These will be considered separately.

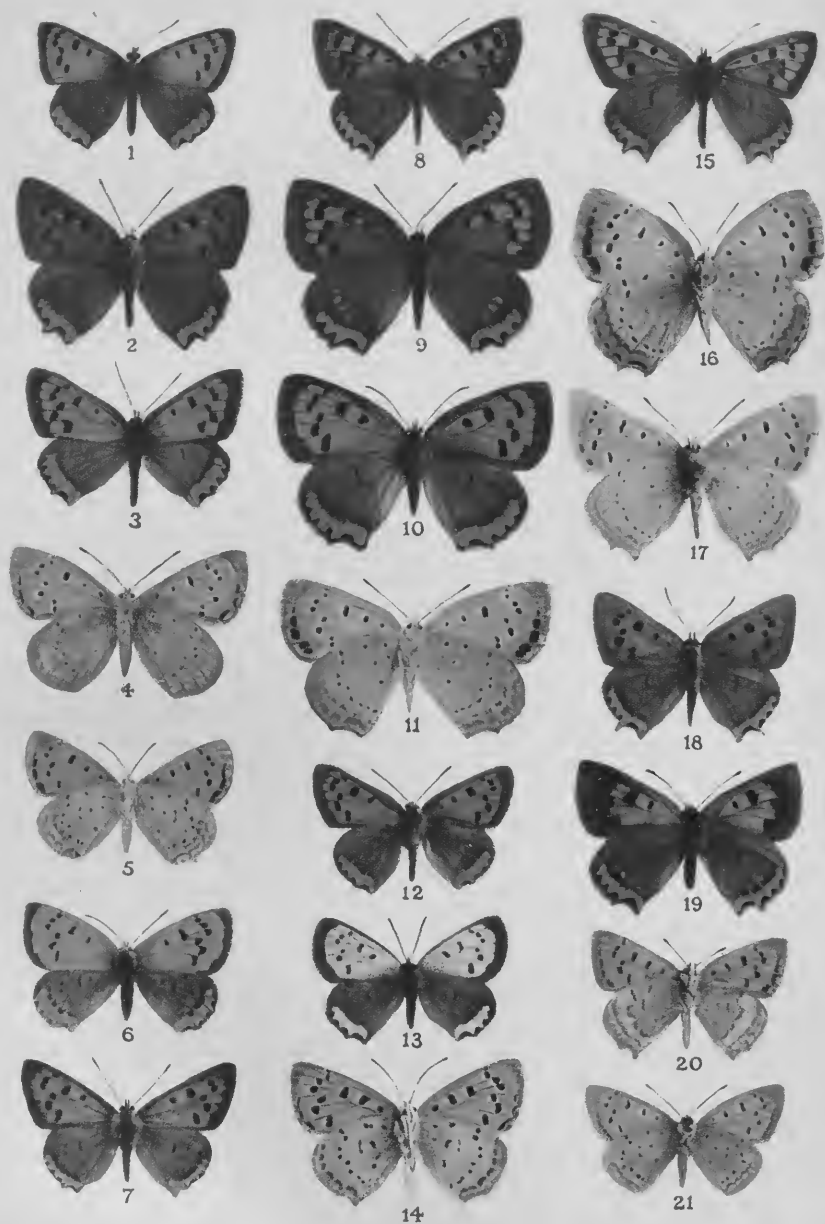
1. Westwards through Arctic Siberia and Russia to Lapland and the extreme north-east of Norway. In the two latter districts it meets the race which inhabits Northern Scandinavia—*hyperborea*. This differs from *hypophlaeas* in one or two important particulars. It is an improbable hypothesis to suggest that the latter race has, in this area, lost the red submarginal band on the lower surface of the hind-wings, and has become modified in other directions, when there is no climatic alteration to account for these differences. The same arguments apply to the reverse change, *hyperborea* to *hypophlaeas*, but with added force, since nothing could be more unlikely, from what we know of the species, that the character typical of Eastern Asia should arise separately in Lapland. Neither does it seem reasonable to believe that *H. phlaeas* has only made a successful migration into the arctic from the coast of China. Central Siberia might prove an obstacle to invasions from the south, so that specimens, having gained the north coast by way of Amurland and the east, could spread westwards undisturbed. Certainly, however, Norway and the Baltic Coasts present no such difficulties. All these facts point in one direction. That *hyperborea* and *hypophlaeas* are distinct in origin; the former being European, and connected with more southern latitudes by intermediate forms (see p. 710); the latter Eastern Asiatic, and retaining the stamp of that area. Their superficial resemblance is probably due to convergence, both having been modified by arctic conditions.

2. But a second migration seems to have taken place from North-Eastern Siberia. This has been eastwards across the Bering Sea, probably by way of the Aleutian Islands, into Alaska, thence populating North America. Hence in the north of the Nearctic Region we find a form displaying the chief characteristics of the Chinese *phlaeas* modified by arctic conditions. But as it spreads southwards heat begins once more to affect it, so that, in the

Racial Broods, suffusion may appear and the lower surface of the hind-wings may sometimes become dark brownish in colour. The Constant Broods are subjected to conditions less likely to alter their appearance, so that they remain of the true *hypophlaeas* type and are, in this sense, more primitive.

It has been pointed out previously that the species does not vary racially in the greater part of North America, and that even specimens from such southern localities as California and Texas are typical of *hypophlaeas* at least in the Constant Broods; they are, in fact, arctic in character. These two facts are very remarkable, especially so when we remember that *H. phlaeas* has so great a capacity for forming local races and, in the remainder of its range, that it varies from place to place in a most surprising manner. In my opinion they admit of but one explanation—that the species has populated America at a recent date, and that it has not had sufficient time to lose its arctic features or to form local races. We see, as it were, the first beginnings of a new form in a few Racial-Brood specimens. There is, however, one exception, viz. the s.-sp. *fieldeni* McLach., which may be regarded as an insect in which all other characters have been subordinated to those called forth by its Far Northern environment. Though it must necessarily have been derived from *hypophlaeas*, the red submarginal band on the under surface of the hind-wings is lost, so that its Asiatic origin is no longer apparent. It is not, I think, unreasonable to suppose that the unparalleled conditions existing at the highest latitude to which butterfly life can extend, should effect a radical change in the appearance of the insect in a space of time insufficient to produce any regular change, even in the broods subjected to the summer warmth of California.

The above hypothesis assumes that the red submarginal band on the under surface of the hind-wings is more stable in character than are the other local changes in the appearance of *Heodes phlaeas*. It may well be asked if there is any evidence for such a conclusion. I think there is. Early in this memoir (p. 696) the Racial Broods were defined as those which “are produced at a time when the high temperature and peculiar climatic conditions of a given locality can most readily act upon the species and produce their characteristic effects.” In every locality in the Palaearctic Region which has been studied in the foregoing



1. Robinson, photo.
 11. Eltringham, pnx.

Vaus & Crampton, Ltd.

FORMS OF *HEODES PHLAEAS*.

pages, peculiar local races have been seen to develop in the Racial Broods, only to be replaced once more by the typical form in the Constant ones. Only two exceptions to this rule come to my mind—the underside of the hind-wing of the s.-sp. *phlaeoides* remains unaltered in the Constant Broods, and so does the red submarginal band of the Eastern Asiatic races. In China and Japan Constant and Racial Broods are well marked. The latter are large and suffused, characters which are lost in the Constant Broods; they differ also in the Critical Spot. The red band alone remains unchanged, affording one of the very few instances in which a racial feature possesses sufficient stability to withstand marked alterations of temperature. If the conclusion be sound that the Nearctic forms of *H. phlaeas* were derived from the Eastern Asiatic race, then the stability of this feature in the New World is only what we should expect, seeing that it is the very same character which has been shown to be especially stable in the Old.

DESCRIPTION OF PLATE LIV.

Heodes phlaeas L

- FIG. 1. Madeira (s.-sp. *phlaeoides* Stgr.), Constant Brood.
2. Japan ♂ (*japonica* n.s.-sp.), Racial Brood.
3. Tian-Shan (*coccineus* n.s.-sp.).
4. " " " underside.
5. North America (s.-sp. *hypophlaeas* Bdv.), underside.
6. Norway (*hyperborea* n.s.-sp.).
7. Berlin (ab. *schmidtii* Gerh. much suffused).
8. Madeira (s.-sp. *phlaeoides* Stgr.), Racial Brood. (In this figure the suffusion is not sufficiently pronounced.)
9. Japan ♀ (*japonica* n.s.-sp., ab. *daimio* Seitz), Racial Brood.
10. China ♀ (s.-sp. *chinensis* Felder), Racial Brood.
11. " " " " underside.
12. North America (s.-sp. *hypophlaeas* Bdv.).
13. " " (s.-sp. *hypophlaeas* Bdv. ab. *alba* Tutt).
14. Norway (*hyperborea* n.s.-sp.), type, underside.
15. India.
16. Japan (*japonica* n.s.-sp.), type, underside; Racial Brood.
17. India, underside.
18. Asia Minor. S.E. coast. ♂ Racial Brood.
19. Algeria, Ain Sefra. a recurrent aberration. Racial Brood.
20. Madeira (s.-sp. *phlaeoides* Stgr.), Constant Brood; underside.
21. Lapland (s.-sp. *hypophlaeas* Bdv.), underside.

APRIL 15TH, 1924.

B. C. S. WARREN, F.E.S.

*Preliminary description of a new
Spanish race of Powellia sao.*

[Reprinted from *The Entomologist's Record*, Vol. XXXVII., No. 5.]

Preliminary description of a new Spanish race of *Powellia sao*.

By B. C. S. WARREN, F.E.S.

In view of the results of Sig. O. Querci's expedition to Spain last summer, the following brief description of a very interesting Spanish Hesperid may be of use. The full details of both structural and superficial characteristics of this insect were worked out long ago in the preparation of a monographic work on the Hesperids; but as for various reasons this work cannot be published for some time to come, I felt it desirable to publish a brief account of this form without further delay.

Powellia sao race **guadarramensis**, nov.—The largest known form of the species, averaging 30-31mm. (centre of thorax to tip of forewing $\times 2$). Very richly coloured; the light superscaling on the basal area of the upperside of the forewings, golden-yellow. On the underside of the hindwings the ground colour is vivid red, much deeper in shade and more brilliant than it is in Central European specimens. The average size of type *sao* is 26-28mm.

The type specimens of *guadarramensis*, which are in the Oxford University Museum, were taken at La Granja by the late Rev. F. E. Lowe.

The great size of this race, which is more remarkable than the measurements would lead one to suppose, is particularly interesting when one recalls that almost the commonest form of *sao* in Central Spain is the tiny race *gracilis*, Vrtýl., which occurs with typical sized *sao* all over the country; yet in the central districts this great race is produced in company with the typical sized and very small races. Mr. Lowe suggested, in 1908, that *guadarramensis* was possibly a distinct species, which idea has recently been put forward again by Sig. Querci. Thanks to the kindness of Prof. Poulton, I was lent the whole series of Mr. Lowe's specimens, and allowed to dissect some of them; the resulting mounts showed, however, that these giant Spanish specimens are, anatomically, indistinguishable from type *sao*, and from the other forms of Spanish *sao* too. The type specimens of race *guadarramensis* will be illustrated later on.

LIST OF BUTTERFLIES TAKEN IN THE EXTREME NORTH-WEST
CORNER OF THE DEPARTMENT OF HAUTE SAÔNE IN FRANCE
BETWEEN APRIL 12TH AND AUGUST 7TH, 1921, AND BETWEEN
MAY 4TH AND OCTOBER 3RD, 1922; WITH REMARKS.

BY F. C. WOODFORDE, F.E.S.

Before commeneing the list, a short account of the general physical features of the district may not be out of place. The surface is a rolling plain, varying from about 800 ft. to 1000 ft. above sea-level. A large part of it is highly cultivated, and consists of pasture and arable land. There are no hedges, and only the pastures intended for grazing are enclosed, with posts and barbed wire. On three sides—north, east, and south—are large woods, the property of the state, that on the north extending in length or breadth for many miles. These differ from English woods in one respect, for there being no hunting with packs of hounds, they have no wide rides through them. The undergrowth is extremely thick, and varies from about 15 ft. to 20 ft. in height, and the large trees run to a height of between 40 ft. and 60 ft. For the use of woodcutters and sportsmen, paths about 3 ft. wide permeate the woods in every direction. Owing to the height of the underwood these paths are almost entirely sunless, and only an occasional butterfly is to be seen in them. Sometimes considerable strips of land outside the woods are left uncultivated and wild, and it is on these and in the unfenced pastures that most of the butterflies are to be found. There was, however, a grassy lane about half a mile long, leading from one of the villages to another, running through the South Wood. This road was full of wild flowers, and was a very favourite haunt of butterflies. Annually, over a tract of several acres, the underwood and some of the trees are cut down, but as very few flowers grow in these clearings, very few butterflies visit them. Except in the woods and on the arable lands, there is an extraordinary abundance of wild flowers everywhere.

The subsoil is clay. This clay is largely used for tile-making, and the "Tuileries" are numerous. Many tiles are spoiled in the baking, and many more are broken. These defective tiles are used for repairing the roads leading to and from the Tuileries, and are soon broken up by the traffic into very small fragments, and in time form a smooth road. After a shower these roads are a favourite haunt of many species of *Lycaenidae*, which settle on them to suck the moisture. Many times in 1921 clusters of from 150 to 200 "blues" were observed settled on a space of three or four square yards. These assemblies always consisted entirely of males, no female ever being seen in them. The species were

I. icarus, *semiargus*, *cyllarus*, *baton*, and *minimus*. In 1922 the assemblies seldom contained over 20 individuals. Groups of "whites," also consisting entirely of males, of the species *P. rapae* and *napi* and *L. sinapis*, but in much smaller numbers than the *Lycaenidae*, were to be seen. The two families were generally in different spots. The main roads were metalled with stone, and only very occasionally were butterflies seen settled on them.

The following is a list of the butterflies observed in the two successive seasons of 1921 and 1922:—

PAPILIONIDAE.—*Papilio sinon* Poda (*podalirius* L.); uncommon. Less than a dozen were seen, the first on May 27th, the last much worn on June 8th: *machaon* L.; fairly common in permanent pastures throughout the summer until August.

PIERIDAE.—*Aporia crataegi* L.; common everywhere. *Pieris brassicae* L.; very common: *rapae* L.; very abundant all through the summer up to October: *napi* L.; common: *daphidice* L.; rare, only seen in late July and August. *Euchloe cardamines* L.; common. Specimens in 1922 were very small, doubtless owing to the heat and drought of the summer of 1921. *Leucophasia sinapis* L.; very common. *Ab. erysimi* Bkh. was common in the second generation. *Colias hyale* L.; common in late July and August 1921; much rarer, 1922: *edusa* Fab.; uncommon. *Gonepteryx rhamni* L.; very common.

LYCAENIDAE.—*Thecla* (*Zephyrus* Dalm.) *betulae* L.; rather uncommon: *ilicis* Esp.; local and not very common: *pruni* L.; very local and seldom leaving the higher branches of the sloe-bushes. These often reach a height of from 15 to 20 ft., and form clusters 20 yards long or more. The clusters form a slope like the roof of a house. Very occasionally a specimen will come down and settle on one of the smaller plants, giving one a chance of catching it. *T. (Zephyrus) quercus* L.; very rare. *Callophrys rubi* L.; common. *Chrysopterus dispar* Haw. v. *rutilus* Wernb.; local but not uncommon in marshy meadows in August, none seen earlier: *dorilis* Rott.; common in both generations: *phlaeas* L.; rare. *Lycaena argiades* Pall.; rather common, much more so in the second generation than in the first, and much larger: *aegon* Schiff.; common everywhere: *argus* L.; not very common: *astrarche* Berg.; not common: *baton* Berg.; not common: *icarus* Rott.; very abundant; *ab. icarinus* Meig. rare: *thersites* Cantener; local and not common: *corydon* Poda; rare: *argiolus* L.; rather uncommon: *semiargus* Rott.; abundant: *minima* Fuessly; much commoner in 1922 than in 1921: *cyllarus* Rott.; abundant, several ♀♀ taken: *arion* L.; in small numbers throughout the district, from June to August: *alceon* Fb.; extremely local but fairly numerous in the very small area in which it occurred.

ERYCINIDAE.—*Nemeobius lucina* L.; fairly common.

APATURIDAE.—*Apatura iris* L.; very local but fairly common in 1921, much rarer in 1922: *ilia* Hb.; local but abundant in 1921, rather common in 1922; *ab. clytie* Hb., in about equal numbers with the type.

NYMPHALIDAE.—*Limenitis populi* L.; very rare: *sibylla* L.; locally common: *camilla* Fb.; not common and extremely local. Only six specimens were seen, all singly, on June 5th, 6th, 8th, and August 3rd, 20th, and 27th. All were in the same small area of about 20×5 yards; none were seen anywhere else. *Araschnia levana* L.; none of the first brood seen in 1921 or 1922: var. *prorsa* L.; rather common in 1921, but none seen in 1922. It is to be noted that April 1922 was extremely wet, rain falling on every day, and the total for the month exceeded 4 inches. *Polygonia c-album* L.; common. Very partial to carrion; a very fine dark suffused variety was netted feasting on the stained part of a piece of paper lying on the ground which had been used in wrapping up the carrion for transportation. *Vanessa polychloros* L.; not very common. This species was also partial to carrion: *urticae* L.; very common: *io* L.; not common: *antiopa* L.; rather rare. *Pyrameis atalanta* L.; not very common, fond of *Eupatorium* flowers: *cardui* L.; not very common, fond of clover and wild marjoram flowers. *Melitaea aurinia* Rott.; abundant in suitable localities: *cinxia* L.; local and rather uncommon; *didyma* Ochs.; very rare: *phoebe* Knoch; very rare: *parthenie* Bkh.; fairly common: *dictynna* Esp.; common but local: *athalia* Rott.; very abundant. *Argynnis paphia* L.; very common: *aglaia* L.; common: *adipe* L.; common: ab. *cleodora* Ochs.; rare. Only two seen, 1st July 1921 worn. 1st August 1922 in good condition: *lathonia* L.; in 1921 rare till the middle of July, then common; in 1922 not seen till August and then rare: *euphrosyne* L.; not at all common: *selene* Schiff.; not very common, rather more numerous in second generation: *dia* L.; rare in spring and not common in August: *ino* Esp.; abundant.

SATYRIDAE.—*Melanargia galathea* L.; very abundant. *Erebia medusa* Hb.; local but uncommon in suitable situations: *aethiops* Esp.; local but not uncommon: ab. *leucotaenia*; rare. *Pararge maera* L.; common: *megaera* L.; common: *egeria* L.; not common: *ackine* Scop.; local but common in 1921, rare in 1922. *Epinephle jurtina* L., *tithonus* L., and *hyperanthus* L.; all common; no specimens of the ab. *arete* Ochs. of the latter were seen. *Coenonympha hero* L.; common but local: *iphis* Schiff.; very abundant: *pamphilus* L.; very abundant throughout the summer: *arcania* L.; abundant.

HESPERIDAE.—*Spilothyrus alceae* Esp.; local and not common: *altheae* Hb.; very local and rather rare. *Syriethus carthami* Hb.: *malvae* L.; abundant; ab. *taras* Meig., two specimens taken in 1921: *sao* Hb.; rather rare. *Nisioinades tages* L.; abundant in spring, fairly common in August. *Hesperia thauwas* Esp.; common: *sylvanus* Esp.; common. *Carterocephalus palaemon* Pall.; common but local.

Here a note may be made on the partiality to carrion exhibited by many species of butterflies. This taste has long been noted in the genus *Apatura*, but in the woods of this part of France it was exhibited by many other species, especially by *Limenitis sibylla*, *Grapta c-album*, *Vanessa polychloros*, and *E. jurtina*. These were regular visitors to the bait laid down. Other species of less frequent occurrence were

Melanargia galatea, *Argynnis aglaia*, and on one occasion *Tanessa prorsa* and the *Apaturas*, *G. c-album*, and *E. jurtina* were attracted by sheets of newspaper in which the carrion had been wrapped for transportation, and visited this almost as freely as the carrion itself.

Hope Department,
University Museum, Oxford.
January 1923.

SOME INSECTS OF HISTORIC INTEREST IN THE 'DALE'
COLLECTION OF EXOTIC LEPIDOPTERA AT OXFORD.

BY JAMES J. WALKER, M.A., R.N., F.L.S.

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The late Edward Robert Dale, at the time of his tragic death in August, 1903, was in possession of his father's collection of exotic Lepidoptera; and in his obituary notice (*Ent. Mo. Mag.* xxxix, pp. 225-6) his brother, Charles W. Dale, wrote as follows: 'The ultimate destination of (this) collection is unknown, but it may be mentioned that it contains some arctic insects taken by Capt. Ross and figured by Curtis in the Appendix of Ross's work.' Later on (*l.c.* p. 300) he writes: 'I am glad to say that I have secured my father's collection of foreign insects and my late brother's own collection of British, and that they are at Glanvilles Wootton.' On his decease in 1906 this exotic collection passed with the Dalean insects to the Oxford University Museum, where it now stands in the 'Hope Department' in exactly the same state as when received.

This series of exotic Lepidoptera, which is contained in three medium-sized cabinets, is not a very large one, and many of the specimens are very 'aged' and otherwise in indifferent condition. But it includes a fair number of species that are still rare and difficult to come by, and the Arctic insects alluded to above are of special value as souvenirs of more than one of the great expeditions of the early nineteenth century for the discovery of the North-West Passage, and of those engaged in the prolonged search for Sir John Franklin and his gallant companions. In particular the specimens collected by Commander, afterwards Rear-Admiral Sir James Clark Ross, the second in command of the ill-fated expedition of the 'Victory' to Prince Regent's Inlet (1829-1833), are of the highest interest, as they were preserved and brought home under conditions of hardship and danger almost without parallel in the whole history of Arctic exploration.

Some interesting bionomic notes on certain of the species by Commander Ross may be worth disinterring from the ponderous and not very accessible volumes in which they are entombed,

As this voyage was not under Government auspices, the specimens of Natural History which eventually reached England were not claimed for the nation, but were evidently dispersed, and very few of them can now be traced. The insects of the expedition were described by John Curtis in the Appendix to the 'Narrative of a Second Voyage in Search of a North-West Passage,' by Captain Sir John Ross (pp. lix-lxxx), and were illustrated by a coloured plate fully worthy of his great reputation as an entomological artist. It would appear that the Ross specimens now at Oxford, which are probably almost the only ones now extant in England, were given by Curtis himself to his lifelong friend, James Charles Dale.

The species now under notice are referred to under the names and in the sequence in which they stand in the Dale Collection.

1. *Colias Chione* Curtis, Appendix, Ross Narrative, p. lxi, Plate A, fig. 6. A male in rather worn condition, labelled 'Chione, Curt. Ross Appen.' This specimen agrees in all respects with Curtis's figure, except in having a very narrow and faintly indicated blackish border to all the wings. The greenish tint towards the margins of the wings in this and the following species is somewhat over-emphasised by the artist.

2. *C. Boothii* Curtis, Appendix, Ross Narrative, pp. lxi-lxvii. Four specimens standing under this name; the general label for these is 'Arctic America, Capt. Sir J. C. Ross, R.N.' Three of these, in somewhat worn condition, correspond very well with figs. 3, 4 and 5 of Curtis's plate, but none of them have the orange suffusion of the fore-wings shown by the specimens of this butterfly collected by Mr. D. Hanbury in a somewhat lower latitude on the coast of Arctic America, and beautifully figured by Horace Knight (*cf.* Elwes, Trans. Ent. Soc. Lond., 1903, pp. 242-3, pl. ix, figs. 1, 4, 5). The effect of the rich dark moss-green of the under-side of the hind wings of the Ross specimens, with its crimson-bordered central spot and fringes, is really charming. The fourth specimen, a rather worn female set to show the under side, is undoubtedly *C. nastes* Boisd., apparently unrecognised as such by Curtis, who writes as follows (*l.c.* p. lxi): 'Knowing how variable some species of the genus *Colias* are, I have great doubts if this (*C. Chione*) be any more than a variety of *C. Boothii*. There are other specimens, which I believe are varieties of the female occasioned by age or other circumstances, being much paler, with the black of the nervures very much suffused, so much so in one specimen as to render nearly the whole of the superior wings of the same colour

as the fimbria.' These specimens were in all probability *C. nastes*. Curtis quotes Commander Ross as follows (*l.c.*, pp. lxvi-lxvii): 'These butterflies generally appear about the middle of July, as well as the two following species (*Hipparchia Rossii* Curt. and *H. subhyalina* Curt.); they are chiefly found upon the *Oxytropis Campestris* and *O. Arctica*, two papilionaceous plants; they were captured from the 14th of July to the 13th of August, 1830, and on the 19th were in a very wasted state; on the 14th of July, in the following year, only one *Colias* was taken.'

3. *Melitaea Tarquinius* Curtis, Appendix, Ross Narrative, p. lxviii. Two specimens standing under this name, both females in fairly good condition; the larger one is labelled 'Tarquinius Curt.' and 'Capt. Ross'; the smaller, set for the under side, 'No. Pole' (!) 'Capt. Ross' in the handwriting of James Charles Dale; both are labelled below 'Arctic America, Tarquinius.' The first of these is *Brenthis freija* Thunb., the characteristic pattern of the under side of the hind wings being very well marked; the second is probably a form of the very variable *B. chariclea* Schneid. Of these butterflies Commander Ross remarks (Curtis, *l.c.* p. lxix): '*M. Tarquinius* was an abundant species, and like the *Coliades* was found feeding on the flowers of *Oxytropis Campestris* and *O. Arctica*: specimens were captured on the 10th of June, and between the 2nd and 14th of July, 1830, they were most abundant; in 1831 the first butterfly seen was one of this species; this was on the 10th of July, and on the 14th two more were taken.'

'Commander Ross was so fortunate as to discover the caterpillar, apparently of this species.' He gives a brief description of a larva of the usual *Argynnid* type, and further states: 'One that was found under a stone in the middle of March, and of course perfectly hard frozen, showed symptoms of life in half-an-hour after being brought into the cabin, and in less than an hour it was walking about the table.'

4. *Argynnis (Brenthis) Polaris* Boisd. A worn specimen of a small Fritillary (apparently a ♀, but the abdomen is missing), is probably referable to this species. It has two labels on its pin, besides 'Polaris B.' at side; the first is 'Tullia(?), Whale Island, Capt. Parry, fr. Miller, Bristol 18—,' in J. C. Dale's handwriting; and 'Tarquinius(?), Whale Island.' Another label below the specimen reads 'n.s. in Mus. Br. (sevl.).' The locality 'Whale Island' is almost certainly the 'Whale Fish Islands' in Baffin's Bay (lat. 69° 0' N., long. 53° 13' W.), where H.M. ships 'Hecla' and 'Fury,' under Captain Parry, on his third expedition for the dis-

covery of a North-West Passage, anchored during the outward voyage on June 26th, 1824. Lieut. James Clark Ross, of the 'Fury,' writes (Parry's Third Voyage, Appendix, Zoology, p. 113): '*Melitaea Tullia* Fab., Faun. Groen., p. 192. Taken very abundantly at Port Bowen' (lat. $73^{\circ} 14'$ N., long. $88^{\circ} 55'$ W.) 'and found in all parts visited by the late Expeditions.' It is probable that this note refers to more than one species of the small Arctic Fritillaries.

5. *Dasychira Rossii* Curtis. The two insects standing under this name are of two distinct species. The first, which is in surprisingly good condition considering its probable age of well over a century, is a ♂ *D. (Gynaephora) groenlandica* Wocke. It is labelled 'Taken in Melville Island in the Arctic Sea by Mr. Fisher. Jas. Wilson, Esq.' Dr. Alexander Fisher was Assistant Surgeon, H.M.S. 'Hecla,' in Parry's memorable first voyage in search of a North-West Passage in 1819-20, when the expedition discovered Melville Island and wintered there. The few insects brought home were described by the Rev. William Kirby in the Appendix to Capt. Parry's narrative of the voyage (pp. 44xv-ccxvi); he there says: 'Two or three specimens of a caterpillar were obtained in Melville Island, one of which was brought to England. They were found wandering in the neighbourhood of *Salix arctica* and *Saxifraga oppositifolia* . . . It is of that tribe of caterpillars which Reaumur calls *Chenilles à brosses*, the perfect insects of which constitute the genus *Laria* of Schrank, for instance *Bombyx fascelina* Fab. etc.' He makes no mention, however, of the imago. The range of this moth extends farther northward than that of any other of its tribe, as Capt. Fielden, the naturalist of H.M.S. 'Alert,' found numerous larvae in lat. $82^{\circ} 30'$ N., besides a ♂ imago, now in the National Collection, on July 6th, 1876 (cf. McLachlan, Journ. Linn. Soc., Zoology, Vol. xiv, p. 112).

The second example is a very worn and faded ♂ of *D. (Gynaephora) rossii* Curtis, in which the clearly defined markings of the beautiful figure (*l.c.* Plate A, fig. 10) are scarcely to be traced. In the Oxford University Museum there are two fine ♂ specimens of this species from 'Prince of Wales Sound, Hudson's Strait, lat. $62^{\circ} 35'$ N., long. $77^{\circ} 22'$ W.,' which agree very well with Curtis's figure. The Dale insect is labelled '1. *Rossii*' and '16. *Rossii* Curt. ♂, Capt. Jas. Ross.' Of this species Curtis writes under the name *Laria Rossii* (*l.c.* pp. lxxi-lxxii): 'It is a very abundant species, especially in the caterpillar state, for about a hundred were collected on the 16th June, 1832, near Fury Beach (lat. $72^{\circ} 40'$ N.,

long. $91^{\circ} 53'$ W.); the first that was seen in the previous year (at the Victory's winter quarters in a somewhat lower latitude) was on the 19th June, and several more on the 23rd. The caterpillar is large and hairy, of a beautiful shiny velvety black, the hairs being somewhat ochreous; there are two tufts of black hair on the back, followed by two of orange. A great number of them are destroyed by various flies and ichneumons, one of which is represented at fig. 1' (*Ichneumon lariae* Curtis, a fine large red species, 'not very numerous'), 'but those which arrive at maturity spin a close web, about the size of a silkworm's and covered outside with its hairs, the pupa is piceous and shining and the back thickly covered with long brownish-ochre hairs its whole length; the moth appears about the beginning of August. The following interesting experiments I have transcribed from Commander Ross's MSS.—About thirty of these caterpillars were put into a box in the middle of September, and after being exposed to the severe winter temperature of the next three months, they were brought into a warm cabin, where in less than two hours every one of them returned to life and continued for a whole day walking about; they were again exposed to the air at a temperature of about 40° below zero, and became immediately hard frozen; in this state they remained a week, and on being brought again into the cabin only twenty-three came to life; these were, at the end of four hours, put once more into the air, and again hard frozen; after another week they were brought in, when only eleven were restored to life; a fourth time they were exposed to the winter temperature, and only two returned to life on being again brought into the cabin; these two survived the winter, and in May an imperfect *Laria* was produced from one and six flies from the other; both of them formed cocoons, but that which produced the flies was not so perfect as the other.—The caterpillar feeds mostly on the *Saxifraga Tricuspidata* and *S. Oppositifolia*.'

6. *Anarta Richardsoni* Curtis. Two specimens, one in good condition labelled '*Hadena Richardsoni* Curt. 18, Capt. Jas. Ross.' This corresponds most accurately in every point of detail with figure 11 of Curtis's plate, and may well be the insect from which he made his beautiful drawing. The second example is somewhat worn, and is labelled 'Lat. $76^{\circ} 1' 10''$, long. 109° , Aug. 14th, 1850. C. Ede, Esq. From F. Smith of Brit. Mus. from A. White, April 1864.' The position given is on the shore of Liddon Gulf in the North of Melville Island; Dr. Charles Ede was surgeon of H.M.S. 'Assistance,' one of the squadron under Commodore Austin in the

Franklin Search Expedition of 1850-1, which wintered off the south coast of Melville Island. The moth is a widely distributed circumpolar species.

7. *Psychophora Sabini* Curtis. Two specimens, in one of which the hind wings and abdomen are missing. This is labelled '*Psychophora sabini* Curt. Ross's Appen.'; the second bears no label, but is in quite good condition. This little Geometrid moth is very briefly described by the Rev. W. Kirby (Parry's First Voyage, Appendix, p. ccxv) under the name of '*Bombyx Sabini*' and noted as 'Found in a swampy part of Melville Island.' The Dale specimens are not as definitely marked as Curtis's figure of the ♂ (*l.c.* Plate A, fig. 12), both being nearly unicolorous fuscous-brown with faintly indicated darker central band and hind-margin of forewings; from the antennae they are evidently females.

It may be added that Curtis described three other butterflies from the Ross expedition, *Hipparchia (Erebia) rossii*, H. (*Oeneis*) *subhyalina* and *Lycaena franklini (orbitulus* Esp. var.). The *Oeneis*, with others of the Ross insects, apparently passed in the first instance into the collection of the eminent French entomologist, Mons. Achille Guenée (*cf.* Elwes, Trans. Ent. Soc. London, 1893, p. 475). In the series of *Colias boothii* in the National Collection is a specimen bearing the following labels: 'Boothia Felix exp. Ross. Paratype ex coll. Gr. Grshm.; ex Mus. Oberthurium; ex Mus. Ach. Guenée; M. Doubleday exp. Ross. Boothia Felix (Cotype). Per Elwes.' It is possible that other Ross specimens still exist in the 'Curtis' cabinet of exotic insects, which since 1863 has been in the Victorian National Museum at Melbourne.

Aorangi, Lonsdale Road,
Summertown, Oxford.

May 3rd, 1927.

The Species of *Notogonia* (Hymenoptera, Larridæ),
occurring in the Mediterranean Basin. By O. W.
RICHARDS, M.A.*

The difficulty I experienced in identifying a species of *Notogonia* captured in the South of France in August 1927 has led me to hope that a summary of the differences between the Mediterranean species might prove useful. My thanks are due to Prof. E. B. Poulton for permission to study the Morice collection at Oxford, to Dr. J. Waterston for much kind help in the examination of the material in the British Museum, and to Dr. F. Maidl, who lent me specimens of certain species from the Viennese Museum. The arrangement of the species of this genus in the British Museum collection is due to Mr. R. E. Turner, and much of the synonymy here published is really based on his work.

Key to the Females.

- 1 (4). Pygidial area shining, only punctured at all closely towards its apex, not covered with closely-set decumbent pubescence. Clypeus with a fairly wide, smooth, unpunctured apical area, which is produced upwards as a slight central keel. (Mesonotum and mesopleura not punctured, but very finely rugulose.)
- 2 (3). Pygidial area narrower, quite closely and finely punctured at the apex. Median segment with its dorsal area finely wrinkled, with transverse striæ indicated; its sides and posterior surface regularly striate *pompiliformis* Pz.
- 3 (2). Pygidial area broader, the punctures larger and not fine and close at the apex. Median segment with the sculpture much more obsolete; striæ faintly indicated only on the upper half of the sides of the median segment and on the lateral part of its posterior surface *opatiennis* Kohl.
- 4 (1). Pygidial area dull, closely punctured, except at the extreme base, which, however, is usually hidden by the preceding tergite, covered with dense, silvery, decumbent pubescence. Clypeus with a narrower, unpunctured apical area.
- 5 (12). Mesonotum and mesopleura finely rugulose, dull. Median segment with its dorsal area finely wrinkled. (Size large; sides of median segment either with very fine, very close striæ, or, if more strongly striate, the striæ are more or less interrupted in the posterior part.)
- 6 (9). Sides of the median segment with coarse striæ widely interrupted on the disc, especially posteriorly. (Wings not very dark. Posterior surface of the median segment regularly striate at its sides, smoother on its disc.)

* Communicated by the SECRETARY.

- 7 (8). Striæ of sides of median segment more effaced posteriorly. Hind femora black *memnonia* Smith.
- 8 (7). Striæ of median segment stronger. Hind femora red *subtessellata* Smith.
- 9 (6). Sides of median segment with no coarse striæ. (Hind femora black.)
- 10 (11). Sides of median segment practically smooth. (Species very much resembling *N. memnonia* Sm.) *trivittata* Kirby.
- 11 (10). Sides of median segment with very fine, very closely set, fairly regular striæ (very different from those of any of the other species). Dorsal surface of the median segment posteriorly defined by a strong keel; some very strong longitudinal keels on the part where the lateral and posterior surfaces join; striæ on the disc of the posterior surface irregular. (Wings dark, with a metallic blue reflection.) *nigrita* Lep.
- 12 (5). Mesonotum and mesopleura (especially the epimera) shining, obviously punctured (except the epimera). Dorsal area of the median segment very coarsely wrinkled.
- 13 (14). Upper part of mesopectus strongly and fairly densely punctured *prætermissa*, sp. n.
- 14 (13). Upper part of the mesopectus much less strongly and densely punctured *nigricans* Walker.

Key to the Males.

The sculpture of the thorax and median segment of the males usually resembles that of their respective females, but is often less strong.

- 1 (6). Hind femora beneath either longitudinally furrowed or excavated near the base, leaving an angle projecting. (Antennæ as in *N. pompiliiformis*.)
- 2 (3). Hind femora beneath longitudinally excavate, so that the postero- and antero-ventral edges are raised into keels. (Wings rather dark. Decumbent hairs on sternites 5-7 longer than those on the previous sternites; 7th with a ridge of short outstanding hairs on each side; 8th slightly emarginate.) *nigrita* Lep.
- 3 (2). Hind femora excavated beneath so as to leave a projecting angle near the base.
- 4 (5). Hind femora more strongly excavate. Front and mid femora nearly bare. 4th sternite widely emarginate; 5th widely emarginate, with a long tuft of hairs on each side; 8th slightly emarginate. *memnonia* Smith.
- 5 (4). Hind femora less strongly excavate. Front and mid femora with a dense fringe of white hairs. 6th sternite broadly emarginate; 7th with a ridge of hairs on each side; 8th slightly emarginate *trivittata* Kirby.
- 6 (1). Hind femora simple.
- 7 (10). Mesonotum and mesopleura dull, finely rugulose, not punctured. None of the apical sternites with outstanding hairs; 8th sternite slightly emarginate.
- 8 (9). Hind femora red. Sides of median segment with the striæ partly effaced posteriorly, though not so much as in the female. (Antennæ as in *N. pompiliiformis*.) *subtessellata* Smith.

- 9 (8). Hind femora black. Sides of the median segment with the striæ stronger and more regular. Antennæ with the 3rd joint much longer than the 2nd, joints 3-13 all distinctly elongate (more than twice as long as broad) and subequal..... *pompiliformis* Pz.
- 10 (7). Mesonotum finely punctured, not very dull; mesopleura, especially the epimera, shining. Some of the apical sternites with dense outstanding hairs; hairs of the 7th and 8th sternites much shorter; 8th sternite not emarginate.
- 11 (12). The upper part of the mesopectus quite strongly and closely punctured. Antennæ as in *N. pompiliformis*. Apex of the 3rd and 4th sternites and whole of the 5th with rather long outstanding hairs *prætermissa*, sp. n.
- 12 (11). Upper part of the mesopectus more finely and sparsely punctured. Antennæ with the 2nd joint very short; 3-5 each a little longer than the 2nd; 6th joint about one and a half times as long as the 5th; 6-13 subequal, distinctly elongate (more than twice as long as broad). Apex of the 4th sternite and whole of the 5th and 6th with rather long outstanding hairs *nigricans* Walker.

I have not been able to examine a male of *N. opalipennis* Kohl.

NOTES ON THE SPECIES.

1. NOTOGONIA POMPILIFORMIS Pz.

Larra pompiliformis Panzer (1809, p. 106).

Larrada agilis Smith (1856, p. 284).

Tachytes nigra Fabre (1886, p. 230).

Larra nigriventris Cameron (1889, p. 127).

Larra nana Bingham (1897, p. 200).

Larra iridipennis Cameron (1900, p. 26).

The types of the species given in the synonymy, except Fabre's species, are all in the British Museum. All are females, and, so far as can be judged in this sex, do not differ essentially from European *pompiliformis*, though in the Indian examples there is a tendency for the striæ of the lateral surfaces of the median segment to be partially effaced. The African examples (= *agilis* Sm.; also a female from St. Vincent, Cape Verde Islands) also appear to be *pompiliformis*.

The species is widespread in the Mediterranean region, where it would appear to be the commonest species of its genus. Adults emerge from their cocoons in the late summer and soon take to winter quarters; they are captured most commonly on their emergence in the spring. The nesting-habits have been described by Kohl (1894, p. 252), Fabre (1886, p. 230), Ferton (1901, p. 98; 1905, p. 67; 1910, p. 152; 1911, p. 359), and Berland (1925, p. 43). The female hunts crickets, *Platyblemmus umbroculatus* Luc., *Gryllomorpha dalmatina* Ocsks., and *G. uclensis* Pant. In the spring small specimens are captured, late in the year almost full-grown larvæ, in either case the prey being very imperfectly paralysed. In the larger prey one or more of the legs

is bitten off to impede movement. The egg is laid transversely on the sternum between the fore and mid pairs of legs. The nest is a shallow tunnel in the earth, only 5-6 cms. deep, leading to a few cells (1-3) situated at the end of short branch tunnels. Berland found the Tachinid fly, *Sphecapata conica* Fall., as a parasite.

2. NOTOGONIA OPALIPENNIS Kohl (1898, p. 98).

This species was described from Oran and Biskra. I have seen a female (Oran), determined by Kohl, kindly lent me by Dr. F. Maidl. The character of the pygidial area and of the median segment appear to be sufficiently diagnostic, but one would like to see a long series, including some males.

3. NOTOGONIA SUBTESSELLATA Smith (1856, p. 277).

This is mainly an Oriental species, but two females and one male from Amara, Mesopotamia, are in the Morice collection. The habits have been observed by G. R. Dutt (1912, p. 198; also in Lefroy, 1909, p. 201). It preys on immature crickets of the genus *Grylloides*. These are dug out of the ground, the wasp never penetrating the cricket's own burrow, even when it is available. Crickets often make good their escape by jumping, and the wasp is only successful after several attempts. When captured the prey is given one or two stings at the junction of the pro- and mesosternum. The cricket is gripped by the antenna, the wasp straddling over it and walking forwards till it climbs up some plant to a foot or so above the ground and flies laboriously away. In approaching the actual nest, the wasp walks backwards, dragging the prey after her. Probably the burrow is made before the prey is captured; the hollow stem of some plant may be used as a burrow, or it may be dug in the soil.

4. NOTOGONIA NIGRITA Lep.

Tachytes nigrita Lepeletier de St. Fargeau (1845, p. 211).

Notogonia pharaonum Kohl (1907, p. 220).

Though the kindness of Dr. F. Maidl, I have examined the unique type of *N. pharaonum* Kohl, which was captured in Egypt; it appears to me to be only a rather small male of *N. nigrita*. This species is, after *N. pompiliiformis*, the commonest of its genus in the Mediterranean region. Captures appear to be most frequent between March and May, but there are three females in the Morice collection taken by Donisthorpe at Bordighera on the 31st of January. Ferton (1911, p. 359) has made some observations on its habits, at La Calle in Algeria. It was found hunting larval crickets in late August and September, looking for them under stones. The wasp was often unsuccessful in its attempts at capture. The burrow is fairly deep, and is often

made in the sides of some natural cavity, such as the hole of a rodent. Saunders (1911, p. 97) also records Eaton's observation of *N. nigrita* preying on a cricket at Biskra on the 22nd of March, so that there are two periods of the year for hunting.

5. *NOTOGONIA MEMNONIA* Sm.

Larrada memnonia Smith (1856, p. 281).

Larrada subfasciata Walker (1871, p. 21).

Notogonia argyropyga Costa (1878, p. 17, footnote).

The types of Smith's and Walker's species, both unique females, are in the British Museum. They appear to be identical with the species better known as *N. argyropyga* Costa. This has an eastern and southern distribution; I have seen specimens from Egypt and Mesopotamia.

6. *NOTOGONIA TRIVITTATA* Kirby.

Tachytes trivittatus Kirby (1900, p. 16).

Larra (Notogonia) expedita Kohl (1907, p. 219).

Kirby's type is a female in the British Museum, where also is one of the co-types of Kohl's species. All the specimens I have seen came from Sokotra.

7. *NOTOGONIA PRÆTERMISSA*, sp. n.

For reasons given in the notes on the next species, I think the present form requires a new name. The type series is five females and one male captured in Ile de Porquerolles, Var, France, in August 1927. The actual type is a male in the collection of the British Museum captured on the 26th of August. The species was not uncommon at damp spots on the cliffs of the island, where also *Pseudagenia carbonaria* Scop., to which the *Notogonia* bears a striking resemblance, was even more common. I have also seen specimens from Corfu; Barcelona; Alger; Tunis; Biskra; Resht, Persia; Mersina, Anatolia; Siala, Soudan.

Description.

Black, with short silvery hairs, especially visible on the clypeus, apices of the 1st to 3rd abdominal tergites, and on the pygidium. Wings slightly infusate, more so in the female. Head and abdomen smooth; thorax with fine and close punctures, which are coarsest on the episterna and almost absent from the epimera. Median segment rather coarsely rugose, becoming irregularly striate on the sides and on the posterior surface. Pygidial area of the female entirely dull and covered with short silvery hairs. Abdomen of the male with the apex of the 3rd and 4th sternites and the whole of the 5th with distinct outstanding dark hairs; hairs of the 6th and 7th much shorter; 8th not emarginate. Eyes in the male separated by as much as the length of the 2nd and 3rd antennal joints, in the female by not quite so much. Antennæ in both sexes with the 3rd joint rather more than twice

as long as the 2nd, the joints from the 3rd onwards subequal and rather more than twice as long as broad. Claws simple. Length: male 6-8, female 8-12 mm.

8. NOTOGONIA NIGRICANS Walker.

Larrada nigricans Walker (1871, p. 21).

Notogonia sculpturata Kohl (1892, p. 221).

Larra (*Notogonia*) *palumbula* Kohl (1894, p. 304).

Leptolarra reticulata Cameron (1900, p. 31).

Notogonia nigricans Turner (1917, p. 319).

A female co-type of Walker's species is in the British Museum. The type of *sculpturata* Kohl was a male from Egypt. Dr. Maidl sent material from Vienna that included the type, though the latter was not specifically indicated. In this series two males from Egypt both belonged to *nigricans*, while a male and female from Barcelona belonged to the species just described as *prætermissa*. The type of *palumbula* Kohl is probably in the collection of Dr. Brauns, of Willowmore, and was not available for study, but I have seen a specimen from Sokotra determined by Kohl.

Cameron's type was also not available, but I follow Mr. R. E. Turner (1917, p. 319), who states that it is an Indian subspecies with a rather more finely punctured mesonotum. Examination of a considerable number of specimens has left me unable to distinguish in any way between the South and East African *palumbula* Kohl and the Egyptian and Arabian form, *N. nigricans* Walk. I have seen specimens of this species from Cairo and Fayum; Djama, S. Algeria; Amara, Mesopotamia; Aden; various localities in E. and S. Africa, e. g. N.E. Rhodesia, Cape Province; Gibraltar; females of apparently the same species from St. Vincent, Cape Verde Islands.

It is unfortunate that in all collections females so predominate some of the forms here treated as one species may prove to be distinct when the males are known.

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XII. *On the Larva of Pterocroce storeyi*, With. (Nemopteridae). By H. ELTRINGHAM, M.A., D.Sc., with additional notes by E. N. WILLMER and C. B. WILLIAMS.

[Read May 2nd, 1923.]

PLATE XI.

AT the meeting of the Society held on November 1st, my friend Prof. Poulton exhibited living examples of a curious creature found in caves in Egypt. The specimens had been brought to the Hope Department by Mr. E. N. Willmer of Corpus Christi College, Oxford. Prof. Poulton subsequently handed them to me for further examination, and I have made a drawing of the insect, which is reproduced on the accompanying plate.

A similar creature was rather fully described some sixty-five years ago by Schaum, though the first notice of such an insect is in a letter from M. Roux to the Baron de Férussac, written at Thebes in Feb. 1832, and published in the *Ann. des Sci. Nat.*, vol. xxviii, 1833. In this letter M. Roux says: "I have come across an animal so extraordinary, so peculiarly formed, that before constituting a genus of the apterous hexapods, I send you a drawing of it. I found it running on the sand which encumbers the interior of the tombs in the rock in the vicinity of the Pyramids of Giseh. I name it *Necrophylus arenarius*."

Baron Férussac in a footnote says: "Is this singular creature not rather the larva of some insect, perhaps a *Mantispa* or *Raphidia*? This could not be determined from the author's drawing, which leaves much to be desired. Examination of the example itself will doubtless throw some light on this curious point."

The drawing referred to is evidently incorrect in several details. The position of the front legs is wrong, and the shape of the body is not fully indicated, whilst a slightly enlarged drawing of the head shows a structure of the mandibles and antennae not found in the specimens examined by the writer, nor, evidently, in those described by Schaum.

Roux' figure was copied by Westwood in the Introduction to the *Modern Classification of Insects*, vol. ii, TRANS. ENT. SOC. LOND. 1923.—PARTS I, II. (JULY)

p. 56, f. 66, 1 (1840). Westwood states on p. 55 that it appears to him "to be a Neuropterous larva, exhibiting considerable affinity with the larvae of the Hemerobiidae. If the relation of the Nemopterac with that family be proved, is it possible that this may be the larva of that genus?"

Schaum's paper which appeared in 1857 was evidently unknown to the late Dr. Sharp, whose figure in the *Insecta* of the Cambridge Natural History is admittedly copied from that of Roux. The figure in the *Genera Insectorum* (Neuroptera) is taken from Schaum. The larva is mentioned also in Cassell's Natural History, vol. vi, p. 13, and by Lefroy in *Indian Insect Life*, p. 152, with a drawing which again is copied from Roux. Lefroy states that a similar insect was found in a house in India.

The only extensive account is that of Schaum, in *Berl. Ent. Zeit.*, vol. i, pp. 1-9 (1857). That author's specimens were obtained in Feb. 1852 in the tombs of Beni Hassan, 200 feet above the level of the Nile. He obtained twenty examples, but could discover nothing of the habits of the insects beyond that they lived on the surface of the debris, and moved with equal facility both forwards and backwards. I may add that they can also move sideways with some agility.

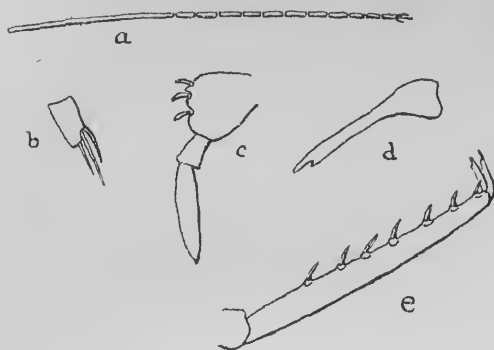
The accompanying plate illustrates the general appearance of the creature. The specimen from which it was drawn was about 8.5 mm. in length from the tips of the jaws to the extremity of the abdomen. The surface is sparsely dotted with small blunt whitish papillae,* and also with a few very minute spines. These seem to serve the purpose of holding grains of sand on the body, though they are not actually adhaesive. Had I possessed more material it would have been interesting to make a closer study of the anatomy and segmentation, though careful examination of the single example I have at present mounted seems in most respects to correspond with Schaum's description.

There is no mouth, but the two sickle-like jaws are formed of an upper and lower portion (really mandible and maxilla) easily separated with a needle. Schaum states that these jaws communicate through internal passages with the oesophagus, which is a long tube passing

* These are similar to the "dolichasters" described by Tillyard (in *Psychopsis*) *Proc. Linn. Soc. N.S.W.*, 1918, xliii, Pt. 4, p. 800.

down the extended neck and widening into a crop in the thorax, whence it passes by a more constricted portion into the stomach, which is reniform. He states that there is no posterior opening of the stomach, so that the food must be entirely assimilated. The jaws are suction tubes, and doubtless the creature lives entirely on the juices of its prey. There is a small intestine into which open Malpighian tubules.

The head of the insect is of the shape shown in the figure, and bears the eyes, the jaws, a pair of very delicate thread-like antennae, and the two labial palpi, hidden in the drawing by the jaws. The latter act as suction tubes. The antennae scarcely described by Schaum are



as shown at *a* in the text-figure. Arising from the small basal part (not shown) there is a long joint, followed by nine to eleven small joints quite distinct under a high power. The number of joints appears to vary in different specimens. The last joint has on it three small setae shown more highly magnified at *b*. One of the palpi is shown at *c*, and my drawing differs slightly though not materially from that of Schaum. The eyes I have not been able to examine critically. Schaum merely states that there are six on either side, but the question of whether they consist of six ocelli, or a compound eye of six facets, must await the acquisition of further material.

The prothorax consists of a somewhat pyriform portion from which extends the characteristic long "neck," which gives the insect so remarkable an appearance. Schaum states, and I think correctly, that the cuticle of the basal part is invaginated at the anterior end and then extended

to form the neck, so that the latter is merely a hardened extension of the connecting membrane between the prothorax and the head.

According to the author quoted, the shape of the abdomen varies considerably in relation to whether the creature has fasted or had a full meal; in the latter case being convex in front and pointed and coniform posteriorly, while in a starved condition the abdomen becomes flattened and shorter behind. The single example from which my drawing was made had certainly fasted, since I had been unable to induce it to attack any of the small insects from time to time offered to it.

Another live specimen overcame and sucked dry a third example, somewhat smaller than itself, confined in the same tube. It is evident that these larvae can go for long periods without either food or water.

Schaum states that the abdominal segments are nine in number, but it is rather difficult to decide where the abdomen ends and the thorax begins. The legs are all of about the same length, though in the drawing differences will be observed which are due to the foreshortening, as the insect is represented as in the walking position. They are of the same sandy colour as the rest of the insect, though with some darker markings as shown. A peculiar feature of the tarsi, which are unjointed, is that the number of spines thereon is different in each pair. The front tarsi have seven, the middle six, and the hind ones five. At least this is so in the example figured. They terminate in a pair of claws slightly dentate at the extremity. A front tarsus is shown at *c* and a claw more highly magnified at *d*.

The cuticle of the animal is rough and tuberculate. The stigmata are said to number nine, but they are difficult to distinguish without making a preparation of the skin. Schaum gives a small figure of the nervous system, admitting that it is incomplete. I have not had an opportunity to dissect this.

The following note on these larvae has been kindly furnished by Mr. E. N. Willmer.

NOTE BY MR. E. N. WILLMER.

The specimens referred to above were obtained in a desert cave on the east of the Nile, at a distance of about ten miles S.E. of Cairo, and up the valley known as Wadi Digla. In the sides of this wadi there were several caves

which pierced the rock horizontally, and sometimes ended in a deep shaft. The floors and rock ledges of the caves were covered with a very fine dust, which proved to be the home of the larval Nemoptera. Their presence was only made evident by blowing on the sand, and thus causing them to move with their quaint jerky motion. During September they all, with one or two exceptions, appeared to be very small. One imago was obtained flying in the rays of the evening sun as they penetrated into the cave at about 5.30. In August, adults can, I believe, be frequently obtained at about this time of day. It may therefore be supposed that the larvae obtained in September were mostly the offspring of the August imagines. We were unable to ascertain what was the food of the larvae in the natural state; presumably it consists of small mites. The larvae were not confined to the caves, but appeared in smaller numbers on all the shaded ledges, provided these contained the necessary dust. A search in the Pyramids at Gizeh, however, proved fruitless, only serving to mystify the guide. Their absence in this locality was strange, since apparently Nemoptera were first reported from the Pyramids and the same type of dust covers the floors of the passages.

The foregoing description and notes were ready for publication when my friend Mr. C. B. Williams brought from Egypt several further specimens, not merely of the larva but also of the imago, and these were submitted to Mr. C. L. Withycombe, who has made a special study of the Neuroptera. The additional material thus provided seemed to offer the opportunity of a joint paper by that Author and myself, dealing with this species, but examination of the specimens showed that the existing classification of the Crocini (Nemopteridae) was based on mistaken premises. The larva here described is now known to be that of *Pterocroce storeyi*, With. Pending Mr. Withycombe's revision of the species, it was thought desirable therefore to publish the present paper very much in the original form.

Since going to Press the following further note has been received from my friend Mr. C. B. Williams.

The larvae of *Pterocroce storeyi* were first discovered by the late G. Storey, the Entomologist in the Egyptian

Ministry of Agriculture, in a cave in the desert about twelve miles south-east of Cairo, about 1915. He bred a few specimens, which, however, were never identified. Before his death he had told me approximately the position of the cave, but shortly afterwards (in May 1922) Mr. Kirkpatrick and I found them in two other caves in Wady Digla, about four miles from Storey's cave. Later we found them also in this latter.

They are found crawling among the dust and small stones on the floor and ledges of the cave, where they feed presumably on small Dermestid larvae, mites, "silverfish" and other small fry found in these situations.

The general conditions necessary for the Nemopterid larvae seem to be cover from above and absence of wind, allowing the accumulation of the fine dust which they like. Most of the situations are dark, but they have been found near the mouth of the cave in full sunlight.

We have since found them in several other caves and also under deep overhanging ledges, and even in small holes in vertical rock faces.

On the other hand, we searched carefully in the entrance to the excavation in the Pyramids of Giza—where the first recorded Nemopterid larva was found—and failed to discover any.

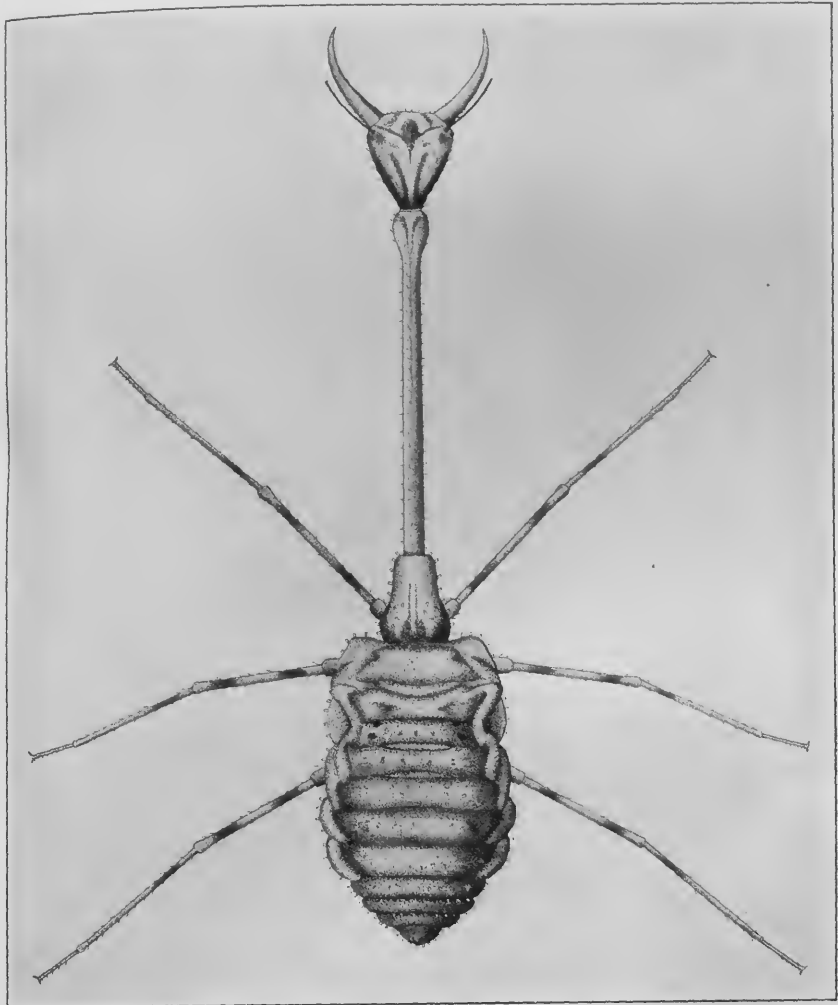
Larvae, both large and small, seem to occur at all times of the year—indicating that more than one year may be spent in the larval stage.

Empty cocoons have also been found in the dust at all times, but the normal pupating season appears to be from May to July.

Adults emerged in July and August, and were seen flying in the caves in Wady Digla in August and September.

They fly about dusk, with an up-and-down, backwards-and-forwards circling movement, the hind-wings spread and hanging down and taking no part in the flapping.

One specimen came into a light-trap in the middle of the Wady.



H. Eltringham del.

Vaus & Crampton.

LARVA OF PTEROCROCE STOREYI. x 20.

Descriptions of new African Rhopalocera.
By G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

Alæna bicolora, sp. n.

♂ and ♀. Upperside: both wings ochraceous yellow, base for a restricted area black. The primaries have the costa broadly and termen very broadly black; the black costa does not fill the entire cell and is invaded beyond the cell by the yellow ground-colour; the cell is closed by a black patch confluent with the costa; the black termen is inwardly concave. Secondaries similar to the primaries.

Underside: both wings with the yellow area, which is paler and specially so in the secondaries, similar to the upperside; the cells are closed by black dashes, and the black termen is invaded by a marginal row on the inner edge of pale yellowish internervular spots, and the yellow fringes are invaded along the veins by prominent blackish dashes in each wing.

Expanse, ♂ 24-26, ♀ 28 mm.

Hab. Usangu district (*Neave*), one ♂. Kongwa, Dar es Salaam, 7 ♂♂ and 1 ♀.

Type, ♂, in the British Museum; type, ♀, in the Hope Museum, Oxford, with seven males, all from Kongwa, Dar es Salaam (*K. St. A. Rogers*).

This is a pretty little species near *aurantiaca*, Butler.

Epamera berbera, sp. n.

♀. Upperside: both wings pale bluish, not bright; in the primaries extending over all the cell and from there nearly to the tornus; in the secondaries over the cell and right along vein 6 nearly to the termen; the rest of the wings blackish.

Underside: both wings dark, dull ashy brown. Primaries with a dark dash closing the cell, a dark postmedian stripe abruptly broken and shifted outwards below vein 5, a dark slightly curved submarginal line; termen very finely dark. Secondaries with an irregular dark dash closing the cell, above which near the origin of vein 7 rises another irregular dark dash to vein 8; a very irregular postmedian line, broken and shifted outwards at veins 6, 5, 4, but at vein 3 shifted well inwards, from whence the line extends in an acute angle outwards into the middle of the fold, and then runs irregularly to the inner margin; a black terminal spot below vein 3, and another black spot with slight metallic scaling at the anal angle on the slight lobe beyond the tail. All the dark dashes and lines have a certain amount of orange scaling visible in a strong light.

Expanse 39 mm.

Hab. Berbera (Somaliland), *H. A. Byatt*.

Hope Dept/ Type in the ~~British Museum~~. 1 ♀.

This is so very distinct an insect on the underside that I do not hesitate to describe it.

Hypolycæna buxtoni rogersi, forma nov.

♂. Both wings uniform, exceedingly dark purplish colour. Primaries with similarly coloured fringes, secondaries with white fringes and with a red lobe spot with blue metallic scaling.

Underside: both wings white, very slightly dusky in the apical and terminal area of the primaries. Primaries with a fine reddish-orange dash closing the cell, a sharply-defined orange postmedian line indented inwards below the costa,

a finer greyer subterminal line well curved inwards below the costa. Secondaries with a bright reddish subbasal spot below the costa, an exceedingly fine line closing the cell; postmedian line as in the primaries, but rather eremulate, with an acute angle in the fold, and then ascending to the inner margin; subterminal line like the primaries, but curving round in the fold up to the termen; a terminal dark line terminating in the upper black spot, which has an orange inner edge, and with a black and orange lobe-spot; between these two spots is some metallic-blue scaling.

♀. Upperside: both wings brown, with a large white patch in the postmedian area of each wing. Secondaries with a brown postmedian line angled on the fold, a broad subterminal line following the contour of the wings, a terminal stripe ending at the upper dark spot, between which and the other black spot is a suffusion of orange colour; lobe-spot orange-colour, with fine black external edging.

Underside as in the male.

Expanse, ♂ 38, ♀ 36 mm.

Hab. Rabai, Mombasa (*K. St. A. Rogers*).

Types in the Hope Collection. A series.

Eicochrysops, gen. nov.

Primaries: wings broad, costa moderately arched, termen less arched; secondaries moderately evenly rounded. Head small, eyes glabrous; antennæ fine, with a longish club, not spatulate. Neuration: primaries, cell longish; vein 2 from beyond its centre, 3 from before the lower angle, 4 from the angle, 5 from the middle of the cell, 6 from the upper angle, 7 from well behind the angle, 8 branched with 7 on a long stalk, 9 absent, 10 from a third from end of cell, 11 bent up to 12, but not actually touching it. Secondaries 2 from the middle of the cell, 3 and 4 from the lower angle, 5 from the middle, 7 from beyond the middle, slightly curved towards costa at the base and long.

The genitalia of the male have the tegumen large and specialized, the harpagines (elaps) are similar in shape to the long arm-like organ in most *Catochrysops*, but the furca is quite free—a mere bifurcate selerite with no anellus.

Type, *Eicochrysops eicotrochilus*.

Eicochrysops eicotrochilus, sp. n.

♂ and ♀. Upperside: both wings uniform, warm brown, slightly tawny in shade. In the secondaries there is a

black subanal terminal black spot, with a smaller and less distinct one beyond it edged broadly internally with orange yellow.

Underside: both wings pale grey, with rather darker spots palely encircled. Primaries with a dash closing the cell; a postmedian row (placed well outwards) of six small spots, that below the costa being placed well inwards, the second, third, and fourth below each other, the fifth shifted slightly inwards, the sixth in line with the aforesaid three; an indefinite row of terminal small spots, broadly encircled with whitish grey. Secondaries with three subbasal blackish dots below each other, the third on the inner margin, which has a very small one above it on the inner margin; a fifth blackish spot near the apex, and immediately below it is a grey spot, which is really the first spot of the postmedian row, but it is separated so much from it that it is better to mention it here; cell closed by a dash; postmedian row, in addition to the one mentioned, consists of six spots, two below vein 6, the next one shifted inwards, the following one shifted further in, that below vein 2 shifted outwards, and the last well inwards on the inner margin; a row of subterminal darker dashes followed by a terminal row of sublunular spots; a subanal black spot edged internally with orange-yellow, which extends into the next neural interspace.

Expanse, ♂ 25-26, ♀ 22-25 mm.

Hab. Fort Jameson, N.E. Rhodesia (*Langshaw*); Ndarugu, Tanganyika District (*Feather*); Salisbury, Mashonaland (*G. A. K. Marshall*); N.E. Rhodesia (*Neave*).

Types in my collection. A series.

This species has hitherto been mixed up with *mahallakoæna*, and is no doubt represented in many collections as its female; when, however, I monographed the genus *Catochrysops*, as represented by Aurivillius in his fifteenth group of Cupido, I found out the error, and that we had another species with both sexes alike. It is very widely spread on the east side of Africa, occurring up to Nairobi, if not beyond.

Both *messapus* and *mahallakoæna*, and also *nandiana*, should be placed in this genus, their genitalia and general pattern being similar.

Eicochrysops rogersi, sp. n.

♂. Upperside: both wings dull violet-blue, with the termen rather broadly brown; in the secondaries there is a black subanal terminal spot.

Underside: both wings pale stone-grey, with darker spots palely encircled. Primaries with a black dash closing the cell; the postmedian row consists of six spots highly ex-curved in the radial area, the second, third, and fourth spots shifted well outwards, the third spot being placed slightly obliquely, fifth spot shifted well inwards, sixth underneath it on its outer half; a trace of a subterminal darkish grey row of dashes followed by a fainter trace of paler terminal dashes in a whitish-grey area. Secondaries with three very small blackish subbasal spots well separated below each other, the third on the inner margin having another above it also on the inner margin; a fifth blackish dot is shifted well outwards below vein 8, cell closed by a pale dash; the postmedian row consists of five spots scarcely darker than the ground-colour, the first three adjoining in a slight curve below vein 6, the fourth shifted inwards, and the fifth outwards; a subterminal row of dashes followed by a terminal row in a pale area; a small black subanal terminal spot with a small internal orange-coloured edging. All the spots of the secondaries are faint and not easy to see.

♀. Upperside: both wings brown, with a very restricted basal area of dark bluish superimposed scales, otherwise as in the male, except that the postmedian row of the secondaries has six spots instead of five, there being an additional spot above vein 6.

Expanse, ♂ 21-25, ♀ 25 mm.

K/ *Hab.* Mabeto, Kenya Colony, January 1921 (*K. St. A. Rogers*), 4 ♂, 2 ♀. 1 ♂, Tongido, E. Africa.

Types in the Hope Museum, Oxford.

This species is quite distinct from its other allies in colour and pattern; the shape and prominence of the postmedian row in the primaries place it next to *eicotrochylus*.

Zeritis neriene muzizii, forma nov.

♂. Differs from the type-form on the upperside in that it is less black. The underside is very different in colour; though the pattern is similar, the black edging of spots and on the veins of the type is almost quite obsolescent; the ochreous spots of the type are replaced by a soft ash-grey, which gives quite a different appearance to the insect; the metallic markings of the type-form are in the primaries much reduced and in the secondaries are almost quite absent.

In one darker specimen the absence of black above and below is not quite so pronounced.

EGUMBIA, gen. nov.

♀. Primaries triangular, broad; costa arched at base, then straight to near apex; termen very slightly arched. Secondaries smallish for the size of the insect, subtriangular. Thorax and abdomen robust. Head small, eyes glabrous, antennæ shortish to about the middle of the costa.

Neuration: primaries, cell reaching to about half the length of the wing; vein 2 from beyond the centre of the cell, 3 from well before the angle, 4 from the lower angle, 5 from the middle of the discocellulars, 6 from the upper angle of the cell, 7 from the apex of the cell, 8 and 9 both stalked with 7 on longish stalks, 10 from a third before apex, 11 from before the middle of the cell. Secondaries with cell broad, not quite half the length of the wing; vein 2 from well beyond the middle of the cell, 3 from just before the lower angle, 4 from the lower angle, 5 from near the centre of the discocellulars, 7 from well behind the upper angle, 8 highly upcurved and long.

Type, *Egumbia catori*, B.-B.

Egumbia catori, sp. n.

♀. Upperside: both wings blackish brown, with pale bluish patches. Primaries with a silvery-blue patch to a little beyond the cell, not reaching into the tornus. Secondaries with the patch more extensive, reaching to vein 6 and nearly into the anal angle, leaving a broad dark terminal border; no lobe and the termen very slightly scalloped.

Underside: both wings pure snowy white entirely markless, the only mark being black points at the end of each vein, which show more prominently in the secondaries than in the primaries.

Expanse 45-48 mm.

Hab. Egumbe, Kabba Province, N. Nigeria, September (Cator).

Type in Cator's collection. 2 ♀♀.

This genus should be included in the *Eptolinæ*.

VIII. *A Revision of the Continental African species of the genus Artitropa* (Lep. Hesperiidæ). By N. D. RILEY.

[Read March 18th, 1925.]

PLATE XXXV.

THE genus *Artitropa* was described by Holland (P.Z.S. 1896, p. 92) to include *erinnys* Trimen, *comus* Cramer, *margaritata* Holland, *boseae* Saalm., and *shelleyi* Sharpe, all African species with the exception of the Madagascan *boseae*. References will be found in Holland's paper referred to above, and also in Wytsman's *Genera Insectorum*, which merely repeats them from Holland, and in Seitz's *Gr. Schmett.*, Vol. XIII. The Madagascan species recently described by Oberthür (*aaron*, *hollandi* and *alaotrana*), and known in this country only from his figures, together with Saalmuller's species, *boseae*, are not included here, as they have been adequately dealt with by Aurivillius in Seitz. With *A. shelleyi* I am not acquainted, nor have I been able to obtain access to the Type specimen; it seems very probable that it does not belong to this genus at all.

Material which has recently been received at the Museum, together with other and more extensive material received by Professor Poulton from Drs. R. and V. G. L. van Someren and from Canon Rogers, and very kindly placed at my disposal, sheds so much more light upon the African species that the following notes would seem not out of place.

1. *A. comus* Cramer.

(a) *A. comus comus* Cramer.

(Plate XXXV, fig. 1, 1a ♂.)

From a careful comparison of the figures of Cramer's *comus*, Drury's *helops*, and Holland's *margaritata*, it is evident that all three represent the female of the West Coast form and are synonymous. The names *comus* and *helops* both date from 1782, but the former has always been given priority, and, in the absence of proof to the contrary, should be retained as the older name. There are specimens in the B.M. from Sierra Leone, the Gold

Coast, and Southern Nigeria, and in the Oxford Museum, from Lagos (S. Nigeria), there is a series of 1 ♂ and 5 ♀♀ bred by Dr. Lamborn. Holland's specimens are said to have come from the Ogowe River, French Congo.

In more eastern localities *A. comus comus* is represented by an easily recognisable subspecies which may be known as

(b) *A. comus reducta* Auriv.

On the upperside this subspecies appears in no way constantly different from *A. comus comus*; the underside, however, is very different. The markings which in *comus comus* are darkest, in *c. reducta* are intensely black, and the colour contrasts consequently much more striking. This no doubt is partly due to the condition of the specimens examined, some of them being bred specimens, but I think not entirely so. The silver markings of the hind-wing, however, present the most obvious differences. The isolated silver spot found in the cell in the ♂ of *comus comus* (joined with the discal transverse band in the ♀) is joined with the much wider and more evenly edged discal transverse band in both sexes in *comus reducta*. In *comus comus* the pale costal spots (in area 8) are greyish; in *c. reducta* they are larger, often partly coalescent, and of the same silvery white colour as the discal transverse band of which the outer one at least forms part. Area 1b in *c. comus* is entirely black (or dark brown), in *c. reducta*, however, it is traversed by the discal silvery band so that the dark portion is confined to the margin.

Habitat.—CAMEROONS: Bitje, Ja River (1 ♂, B.M.). CONGO: "Congo" (1 ♂, B.M.); Fayala, R. Wamba (1 ♀, B.M.). UGANDA: Ruwenzori (1 ♂, 2 ♀♀, B.M.); Toro, Mpanga Forest (1 ♂, B.M.); Entebbe (1 ♀, B.M.; 2 ♂♂, 1 ♀, Oxford Museum); Jinja (1 ♂, 1 ♀, Oxford Museum). KENYA COLONY: Nairobi (1 ♀, B.M.). NYASALAND: Mt. Mlanje (1 ♀, B.M.).

2. *A. MILLERI*, sp. nov.

♂.—Readily separable from both *comus* and *erinnys* by the following characters: *Upperside, forewing*.—A conspicuous linear black sex-mark, commencing on vein 1 just proximal to the triangular spot on that vein, runs outwardly, at a slight angle, to vein 2, but is completely broken at about two-thirds the distance across area 1b, and by vein 2; from vein 2 it runs almost straight to the point of origin of vein 3, along the basal portion of which,

and of vein 4, it is represented by inconspicuous patches of modified scales. On the *hindwing* a prominent subquadrate orange spot (about 2 mm.) in area 7, towards the margin, is characteristic. *Underside, hindwing*.—The discal area is white, not silvery, and, although continuous to the abdominal margin, is cut off from the spots in areas 7 and 8, except for a narrow transverse white bar in area 6, by a broad irregular black band, extending from the base to the hind margin, and following in the main the direction of vein 7. Fore coxae clothed with long black hair; in *erinnys* and *comus* this hair is ferruginous buff.

♀.—Similar to the male, but the orange spot in area 7 of hindwing much smaller.

Habitat.—TANGANYIKA TERRITORY: Tukuyu (formerly New Langenburg), 5,000 feet, 5th October, 1924 (N. C. E. Miller), 1 ♂ (*Type*); N.W. RHODESIA: Solwezi, 29th April, 1917 (H. C. Dollman), 1 ♂; UGANDA: E. Ruwenzori, 6–13,000 feet, 27th January, 1906 (Legge and Wollaston), 1 ♀ (*Type*). B.M.

This species is more likely to be mistaken for *comus* than for *erinnys*, on account of the similarity of the large white discal patch on the underside of the hindwing, but the differences given above should serve to distinguish it. Certain features in the three specimens recorded seem to suggest that each represents a distinct subspecies. In the event of this being confirmed the Tanganyika race from Tukuyu should be regarded as typical.

3. A. ERINNYS Trimen.

Always distinguishable in all its forms from *A. comus* by the pale central area of underside of hind-wing never being silvery white.

(a) *A. erinnys erinnys* Trimen.

Trimen's description of the typical race is so excellent that it scarcely needs enlarging upon. The orange patch at anal angle of hind-wing above extends along the margin practically uninterrupted at least to vein 6, more prominently in the ♀ than in the ♂; there is seldom any trace of additional orange spotting between the base of the wing and the discal macular band; the general tone of the underside is rather greenish-grey, sometimes purplish-grey, and the discal patch (= the "two white macular bands close together" of Trimen) appears more often to

be pale greyish-ochreous than white, for in only two specimens out of thirteen examined can it be called white.

Habitat.—S. AFRICA : Natal, Zululand, etc.

(b) *A. erinnys nyasae*, ssp. nov.

(Plate XXXV, figs. 2, 2a ♂.)

This is a slightly smaller, very much darker race, but with paler, less orange-yellow, narrower and more sharply defined hind-wing discal band, and the marginal yellow line similarly pale and reduced. On the underside the discal patch is white, considerably indented anteriorly by an invasion of the ground-colour at the cell end in the ♂, less so in the ♀; the yellow anal patch confined to the cilia; the general ground-colour dark brown, not tinged with greenish. Hyaline spots of fore-wing larger than in other races.

Habitat.—NYASALAND : Mt. Mlanje (6 ♂♂, 6 ♀♀, including types); Zomba (1 ♂); Blantyre (2 ♀♀). B.M.

(c) *A. erinnys vansomereni*, ssp. nov.

(Plate XXXV, figs. 3, 3a ♂.)

Hyaline markings of fore-wing small, those in areas 2 and 3 well separated; orange band much as in *e. nyasae*, but deep orange in colour; ground-colour very black, orange anal patch of hind-wing well developed and extending to vein 6, but broadly interrupted by black at the extremities of the veins. Underside very dark; the ochreous spot in area 1b of fore-wing seldom any larger than its counterpart on the upperside; central pale patch of hind-wing confined to the disc, not entering the cell at all in the ♂, represented in the cell by an isolated spot towards anterior margin in the ♀, much suffused with black scaling (especially in the ♂) and almost entirely obscured in areas 1a and 1b.

Habitat.—KENYA COLONY : Nairobi (*van Someren*) 8 ♂♂, 10 ♀♀, bred Sept. and Oct. 1923 and July, Aug. and Sept. 1924, in Oxford Museum; 3 ♂♂, 5 ♀♀, bred Dec. 1923, in B.M. *Types* in B.M.

Some difference is noticeable between the series of specimens bred in September and October 1923 and that bred in December 1923. The former are decidedly larger, not so black, and with somewhat more extensive orange markings above. In 1924 the specimens which emerged in late July and early August are the largest, those dated late August and September agreeing with the December 1923 specimens. It would seem therefore that the differ-

ences are to be attributed to variations in the conditions under which the insects were bred rather than to any seasonal climatic influences.

(d) *A. erinnys ehlersi* Karsch.

Artitropa ehlersi Karsch, Ent. Nach., XXII, p. 376*, 1896.

Artitropa erinnys var. *unifasciata* Auriv., Wiss. Ergeb. Schwed. Zool. Exp. Kilimandjaro-Meru, II, pt. 9, p. 15, 1910.

Karsch compares this race with *comus*. From his description, however, it is quite clear that he refers to a race of *erinnys*, which was subsequently redescribed by Aurivillius as "differing from the S. African form in that the yellow transverse band of the hind-wing upperside reaches the inner margin and is there strongly expanded; that the yellow marginal band extends from the anal angle only as far as vein 2, beyond which both margin and cilia are dark brown; and that on the underside the two whitish discal bands are completely united to form a broad transverse band in which a black spot in area 1c is included."

Karsch does not state the sexes of his specimens. Aurivillius had only the ♀. The ♂ differs only in having the central pale patch on the underside of the hind-wing invaded anteriorly by an irregular projection of the ground-colour about the discocellulars.

Habitat.—TANGANYIKA TERRITORY: Kilimandjaro (1 ♂, 1 ♀, in B.M.; 1 ♀, Oxford Museum, *Rogers*); N. Usambara, Mlalo.

(e) *A. erinnys radiata*, ssp. nov.

(Plate XXXV, figs. 4, 4a ♀.)

♂ ♀. Most like *A. e. ehlersi*. The transverse orange band of upperside, however, still more extensive, united with the orange anal patch and completely occupying areas 1a and 1b, sometimes reaching the margin also in area 1c in such a way as to leave only a black dash, representing the marginal band, along vein 1b; the veins, where they pass through the marginal black band lighter. General coloration of underside rather light grey brown; central patch of hind-wing large, white, reaching abdominal margin very broadly, the marginal band in areas 1a and 1b consequently reduced in width; the anal area generally strongly tinged with yellowish; the veins conspicuously paler than ground-colour.

Habitat.—KENYA COLONY: Sagalla Mt. (Rogers), 1 ♂, 5 ♀♀, July, August 1913 (including *types*), 1 ♀, Dec., 1 ♀, Jan. 1914; 1 ♂, Jan. 1915. *Types* ♂ and ♀ in B.M.; remainder in Oxford Museum.

(f) *A. erinnys comorarum* Oberth.

This race, although, as its name implies, not from the mainland of Africa, is included here only in order to render as complete as possible the survey of the species. On the upperside it closely resembles *A. e. radiata*, especially in the extent of the yellow areas of the hindwing. On the underside of the hindwing the discal white patch is broken up into separate spots, and only extends towards the inner margin as far as vein 1b.

Habitat.—Grand Comoro.

The preponderance of females in the two species *comus* and *erinnys* is unusual. Of 86 specimens examined 52 are females, only 34 males.

Both species have been bred; *comus* at Jinja in Uganda by Dr. R. van Someren, to whom the discovery of the life-history is due, and also at Lagos by Dr. Lamborn, and *erinnys* at Nairobi by Dr. V. G. L. van Someren, who was led to search for the earlier stages on a food-plant similar to that upon which *A. comus* was found at Jinja. The following extracts are taken from letters written to Professor Poulton by Dr. V. G. L. Someren:—

Artitropa comus. "The eggs when newly laid are a pink colour and, as development goes on, they turn greyish. They are laid singly. Five to eight days elapse before they hatch. The newly hatched larva is yellowish-green with dark head. With each moult the colour changes to a light greenish-white with yellow head with *two black or dark brown spots* (see Plate XXXV, fig. 5). They are voracious feeders and like others of this group rest in curled-up leaves, either naturally curled or leaves with edges approximated and attached with silk. The food-plant is a species of *Dracaena*. The larva pupates in a folded leaf and is attached in the usual way, *i.e.* at the hind end and by a body band. The freshly formed pupa is greenish-white and gradually turns to a dirty pinkish-green covered with a white powdery substance. My specimens emerged in three weeks, but in Uganda they

emerge rather more quickly. The insect is crepuscular and appears to rest during the day. They are not common.

Artitropa erinnys. "The eggs are laid singly for the most part, though two may occasionally be deposited close together. They are laid either on the leaves, upper or under surface, frequently near the base, or on the trunk of *Dracaena reflexa*. They are generally salmon-pink when first laid, but I have seen a female depositing pure white ones. The eggs are hemispherical and attached by the flattened side. There is a slight circular depression on the top, and a series of ridges radiating from the central spot. The eggs turn greyish as development proceeds, and the larvae emerge within 10 days usually, though some carry over for longer periods. The newly hatched larva is 5 mm. long and yellow with a black head. With the second moult the colour changes to a pale greenish-white and the head piece becomes yellow with black spots arranged as shown on Plate XXXV, fig. 6, thus differing from the Uganda race [i.e. *comus*], which has only two spots.

"The larva, even in the early stages, adopts the habit of protecting itself by cutting the edge of a leaf and bending this over, securely fastening it down with silk threads in two or three places; from this tunnel it emerges half out and devours the leaf substance immediately surrounding. On the slightest alarm it withdraws itself into its protective covering. These tactics are adopted throughout the whole larval period—the whole larva is seldom exposed except when changing and reconstructing a tunnel—nevertheless a fair proportion of larvae are parasitised. I have not yet completed the various parasites, but so far two species of ichneumons have been bred out.

"The larva pupates in a tunnel very similar in construction to its 'hide up,' but in addition it spins a fairly close web over the whole of the inside and blocks up the exit with a flimsy web which can be easily torn by the emerging butterfly. The pupa is attached at its anal end and by a body band. A white powdery substance is secreted by the larva during the 24 hours before it finally pupates. The larval period varies according to the freshness of the leaf—between 14 to 20 days, and the pupal stage lasts 20 days or more.

"Judging by the number of eggs, etc., found on one plant one would be led to think that the insect was common,

but although I have kept a sharp lookout, very few imagines have been taken or even seen. They are crepuscular and extremely shy, and rapid in flight."

The differences in the markings of the larval heads noted by Dr. V. G. L. van Someren are confirmed by specimens from other parts of Africa preserved in the Hope Department, Oxford University Museum. Cast skins of *comus* larvae bred at Lagos and received from Dr. Lamborn show the same simple pair of black spots as is exhibited by the Jinja specimens; and a single larval head of *erinnys* from Durban, sent by the late A. D. Miller, similarly exhibits the two pairs of black spots characteristic of the Kenya *erinnys*.

EXPLANATION OF PLATE XXXV.

- FIG. 1. Upperside } of *Artitropa comus comus* Cramer, ♂ from
 1a. Underside } Lagos.
 2. Upperside } of *A. erinnys nyasae* ssp. nov., ♂ from Mt.
 2a. Underside } Mlanje, Nyasaland.
 3. Upperside } of *A. erinnys vansomereni* ssp. nov., ♂ from
 3a. Underside } Nairobi, Kenya Colony.
 4. Upperside } of *A. erinnys radiata* ssp. nov., ♀ from Sagalla
 4a. Underside } Mt., Kenya Colony.
 5. Larval skin of *Artitropa comus* to show the single pair of
 black spots on the head.
 6. Larval skin of *A. erinnys* showing two pairs of black spots
 and also median black markings on the head.
-

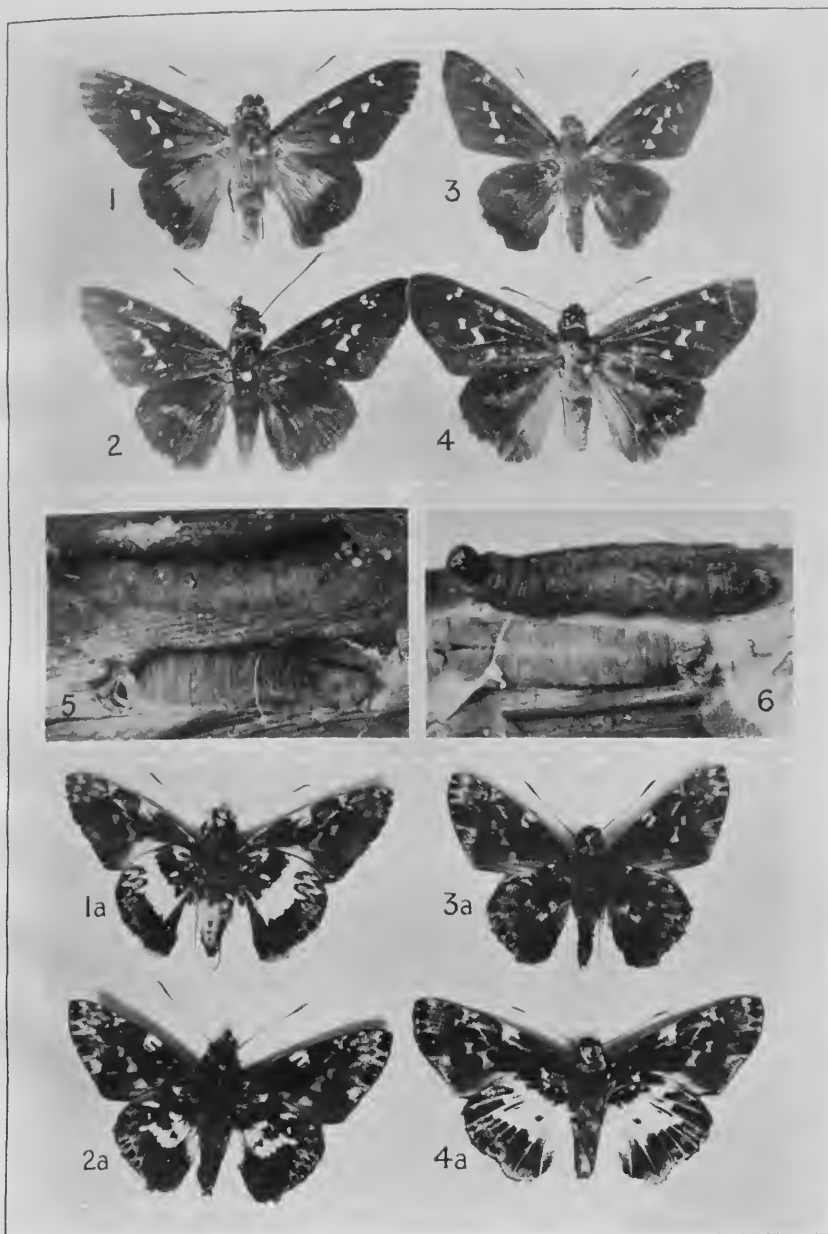


Photo. E. J. Manly.

Vaus & Crampton, Ltd.

A REVISION OF THE GENUS ARTITROPA.

Zur äthiopischen Vespidenfauna. (Hym.)

Rhynchia synagroidea et affinia.

Von Dr. A. v. Schultheß, Zürich.

(Mit 22 Abbildungen.)

Das tropische und subtropische Gebiet der äthiopischen Region beherbergt eine Anzahl solitärer Wespen von synagroideem Habitus, welche den Gattungen *Synagris*, *Rhynchium* und *Odynerus* angehören. Ihr Charakteristikum ist: Schwarze Farbe mit mehr oder weniger Dunkelrot auf Kopf und Thorax; Endsegmente des Abdomens rot oder seltener weiß oder gefleckt; Flügel tief schwarz; Abdomen zylindrisch. In den einzelnen Gattungen finden sich oft vollständig gleich gefärbte Parallelformen, die nur durch die Gattungsmerkmale erkannt werden können.

Da ich in der Lage war, aus den Sammlungen von Missionar Junod, Transvaal (c. m.), Neave, Nordost-Rhodesia (Hope-Museum, Oxford) und den zoologischen Museen Berlin, Paris und Wien ein reiches Material vergleichen zu können, habe ich im folgenden versucht, eine Übersicht dieser Arten zu geben. *Synagris* i. e. S. blieb unberücksichtigt; es wird verwiesen auf die treffliche Monographie von F. Maidl¹⁾.

Besagten Museen sowie den Herren L. Berland in Paris, Gestro in Genua und Maidl in Wien sei hier der wärmste Dank ausgesprochen für Überlassung ihres reichen Materiales sowie Kenntnisgabe von Typen.

Bestimmungstabelle.

1. Kopfschild mit zwei sehr deutlichen, in der Ecke der Spitze beginnenden und etwas divergierend bis über die Mitte des Kopfschildes hinauf sich erstreckenden Kielen (Fig. 1).
Pseudagris 2.
- Kopfschild ohne solche Kiele. 6.
2. Kopfschildkiele lang, die Mitte des Kopfschildes überragend.
Lippentaster 3gliedrig (*Pseudagris* Sauss.) 3.
- Kopfschildkiele kürzer, die Mitte des Kopfschildes nicht erreichend. Lippentaster 4gliedrig. Vgl. *Rh. ardens* u. Nr. 18 ff.
3. Ganz schwarz 3. *S. junodiana* Schulth.
- Anders gefärbt 4.

¹⁾ Maidl, Monographie der Gattung *Synagris*, Denksch. Mathem.-naturw. Klasse Akad. Wiss. Wien 1914, Bd. 91, S. 215—333; Taf. I—V.

4. Thorax ganz schwarz. Letzte Tergite rot oder weiß gezeichnet 5.
- Fühler, Pronotum, beide Schildchen, Mittelsegment und oft auch das 1. Tergit rostrot. 4. *S. versicolor* Schulth.
5. Die drei letzten Segmente größtenteils orangegeb. 2. *S. carinata* Sauss.
- Die drei letzten Tergite mit weißer Binde. 1. *S. albicauda* Schulth.
6. Mesonotum mit zwei erhabenen Längskielen (die aber oft undeutlich sind) (Fig. 3). Hinterschildchen flach mit einem kurzen, horizontalen und einem langen, vertikalen Teile. Kante scharf gezähnt, in der Mitte mit scharf vorspringendem Zahn, der das Ende einer mehr weniger deutlichen Längskante bildet (Fig. 13). Flügelschuppen dicht und grob punktiert (bei *O. carinulatus* spärlicher) 7.
- Thorax anders gestaltet. Flügelschuppen nicht grob punktiert 10.
7. Kleines Tier, 8—15 mm. Das ganze Abdomen hell gelbrot. Mittelschenkel des ♂ nur abgeflacht, nicht ausgerandet. 24. *O. carinulatus* Sauss.
- Größere Tiere, 12—18 mm. Basale Abdominalsegmente schwarz. Mittelschenkel des ♂ auf der Unterseite tief ausgehöhlt nahe der Mitte verbreitert (Fig. 14, 19) 8.
8. Kopfschildunterrand ♂ und ♀ deutlich ausgerandet mit scharfer Zähnen neben der Ausrandung (Fig. 16). Fühlerhaken des ♂ spitz, leicht gegen den Fühler selbst und nach der Seite gebogen (Fig. 17). Größte Breite der Mittelschenkel ♂ nahe der Mitte. Kopfschild des ♂ gelb. 26. *O. magretti* Grib.
- Kopfschildunterrand ♂ und ♀ gerade abgestutzt oder kaum ausgerandet (Fig. 11). Kopfschild des ♂ braun 9.
9. ♀ 18 mm. Grube des 2. Sternits flach, mit mäßig scharfen Rändern. ♂ Fühlerhaken stumpf, wenig gebogen (Fig. 18). Größte Breite der Mittelschenkel (Fig. 19) nahe der Basis. 27. *O. anceps* Grib.
- 9a. Abdominalsegmente 4—6 resp. 4—7 rot. *O. anceps* Grib.
- 9b. Hintere Tergite mit weißen Binden. subsp. *albofasciatus* nov. subsp.
- 9c. Abdomen ganz schwarz . subsp. *totoniger* nov. subsp.
- ♀ 20 mm. Grube des 2. Sternits tief, scharf gerandet. Fühlerhaken des ♂ (Fig. 12) spitzig, scharf, fast im rechten Winkel gebogen. Größte Verbreiterung der Mittelschenkel (Fig. 14) nahe der Mitte des Schenkels. 25. *O. ventralis* Sauss.

10. Abdomen mit weißen Zeichnungen 11.
— Abdomen ohne weiße Zeichnungen 22.
11. Lippentaster 3gliedrig (*Synagris*) 12.
— Lippentaster 4gliedrig (*Rhynchium*, *Odynerus*) 13.
12. Kopfschild mit langen Längskielen. Kiefertaster 5gliedrig
(Fig. 1) 1. *Pseudagris albicauda* Schulth.
— Kopfschild ohne Längskiele. Kiefertaster 6gliedrig.
5. *Rhynchagris vicaria* Stadelm.
13. *Odynerus*. Mesonotum mit zwei erhabenen Längskielen; Hinter-
schildchen mit einem Längskiel (Fig. 13). Kopfschild ♂ und ♀
breiter als lang. Mittelschenkel ♂ verbreitert, auf der
Unterseite ausgerandet (Fig. 19).
27. *O. anceps* Grib. subsp. *albofasciatus* Schulth.
— *Rhynchium*. Mesonotum und Hinterschildchen ohne Kiele. Kopf-
schild birnförmig. Mittelschenkel ♂ ohne Auszeichnung 14.
14. Mittelsegment und Tergit 1—5 (♀) mit je einem weißen, auf
dem Abdomen hell strohgelben runden Seitenfleck. Pronotum
rot (ob immer?) 15. *Rh. osborni* Bequ.
— Abdomen anders gezeichnet 15.
15. Endtergite vom 4. an mit breiter elfenbeinweißer Binde. Hinter-
schildchen stark aufgequollen, mitten eingesenkt, zweihöckrig.
Mittelsegment seitlich mit einem stumpfen Zahn.
23. *Rh. ardens* Guérin subsp. *junodi* Gribodo.
— Hinterschildchen mitten nicht eingesenkt, das Niveau des
Schildchens nicht überragend. Bildung der Mittelsegment-
ecke und Zeichnung anders 16.
16. Tergit 2, oft auch 1 mit kleinen runden Seitenflecken; Rest
des Abdomens schwarz 17.
— Abdomen mit breiten, oft mitten unterbrochenen oder seitlich
abgekürzten Binden 19.
17. Kleine, weißgelbe Flecke nur auf dem 1. Tergit. 1. Segment
viel schmaler als das 2. (*Pachymenes*), von diesem leicht
abgesetzt, leicht gestielt, mitten mit längsgeripptem Feld.
8. *Pachymenes* (false *Montezumia*)
bipunctata Meade Waldo.
— Tergit 2 mit weißen Seitenflecken. 1. Segment anders ge-
staltet, ohne längsgeripptes Mittelfeld 18.
18. Dorsulum schwarz (ob immer?). Hinterschildchenkante ge-
sägt. Seiten des Mittelsegmentes abgerundet, ohne Zahn.
9. *Rh. aestuans* Sauss.
— Thorax und 1. Segment rot. Hinterschildchenkante abgerundet.
Mittelsegmentecken mit scharfem Zahn.

10. *Rh. mephisto* Grib.

19. 1. Tergit mit zwei kleinen weißen Punkten; 2. Tergit mit breiter, seitlich abgekürzter Endbinde.

11. *Rh. grayi* Sauss. var. *sumptuosum* Grib.

- 1. Tergit ohne weiße Flecke. 20.

20. Nur auf Tergit 2 eine breite, weiße Binde.

11. *Rh. grayi* Sauss.

- Tergit 3—4 oder 3—6 weiß gezeichnet 21.

21. Auf Tergit 3—6 mitten unterbrochene weiße Binden resp. große Seitenfleck. . . 14. *Rh. proserpina* Schult.

- Tergit 3—4 mit durchgehender weißer Binde.

12. *Rh. denticulatum* Mocs.

13. *Rh. usambarae* Cam. ♂.

22. Pronotum, beide Schildchen, Mittelsegment, 1. Abdominalsegment orangerot; 2. Segment hie und da mit ebensolchen Seitenflecken. Rest des Abdomens schwarz (bei *O. socotru* alle Tergite mit orangeroten Endbinden) 23.

- Färbung anders 26.

23. Kopfschild ♂ und ♀ unten gerade abgestutzt mit zwei deutlichen, nach außen konkaven Kielchen, die etwas innerhalb der unteren Ecke entspringen und bis oben ans untere Drittel des Kopfschildes hinaufreichen. Kopfschildunterrand so lang wie das 3. Fühlerglied. Fühler ganz orangerot; Augenausrandung schwarz. Hintere Nebenaugen weniger weit voneinander entfernt als vom Netzauge. Flügelschuppen fein punktiert, nur am Vorderrande mit einzelnen größeren Punkten. Hinterschildchen geneigt; seine Kante im Querprofil in regelmäßigem Bogen verlaufend, sehr fein gezähnt. Mittelsegmenthinterfläche wenig vertieft, ohne deutliche Runzeln; obere Kante abgerundet mit ganz schwach markierter Kante; Seitenecke meist mit mehreren, mehr weniger scharfen Zähnen. Flügel auch an der Basis verdunkelt. Metapleuren und Seitenflächen des Mittelsegmentes fein bis sehr fein längsgestreift. ♂ 12, ♀ 13—14 mm.

17. *Rh. rufonigrum* Bequ.

- Kopfschild ♂ und ♀ unten leicht ausgerandet, ohne oder mit ganz kurzen Kielchen; sein Unterrand länger als das 3. Fühlerglied. Fühler vom 4. Gliede an schwarz; Augenausrandung ♀ orangerot, ♂ wie der Kopfschild hellgelb. Hintere Nebenaugen weiter voneinander entfernt als vom Netzauge. Flügelschuppen überall mit zahlreichen groben Punkten bedeckt; Zwischenräume zwischen den Punkten glatt. Hinterschildchen durch eine scharfe, im Querprofil

geradlinige, grob gezähnte Kante (ähnlich *O. dantici*) in eine horizontale und eine vertikale Partie getrennt; letztere schräg nach vorn verlaufend, so daß das Hinterschildchen das Mittelsegment nach rückwärts überragt. Mittelsegment-hinterfläche ziemlich vertieft mit groben diagonal verlaufenden Runzelstreifen. Oberkante sehr scharf, als mehr oder weniger erhabener Grat verlaufend; Seitenecken mit einem breiten, stumpfen Zahn. Flügel bis zum Beginn der Medialzelle hell. Metapleuren und Seitenflächen des Mittelsegmentes sehr grob längsrunzelstreifig 24.

24. *Rhynchium*. Länge ♂ 10, ♀ 12 mm.

16. *Rh. niloticum* Sauss.

— *Odynerus*. Länge ♂ 7—10, ♀ 10 mm 25.

25. Alle Tergite mit breiter orangegelber Endbinde, deren 1. und 2. seitlich sehr stark nach vorn verbreitert sind. Kopfschild ♀ gerade abgestutzt, ♂ halbkreisförmig ausgerandet. Sokotra 30. *O. socotrae* Kohl.

— Nur Segment 1, selten auch je ein basaler Seitenfleck auf Segment 2 orangerot; Rest des Abdomens schwarz. Kopfschild ♂ und ♀ unten seicht ausgerandet. Ägypten, Sudan, Palästina. (Fig. 22) 31. *O. ebneri* Schulth.

26. Schwarz. Tergit 2 mit zwei großen orangeroten oder strohgelben Flecken. Zentral- und Westafrika 27.

— Färbung anders 28.

27. Flecke des 2. Tergits orangerot, mitten nicht zusammenfließend. Mittelsegmentecke mit mehreren starken, spitzen Zähnen.

18. *Rh. synagroides* Sauss. subsp. *aurumaculatum* Sauss.

— Flecke des 2. Tergits strohgelb, mitten zusammenfließend. Mittelsegmentecke abgerundet ohne Zähne (ob immer?).

19. *Rh. sulphureomaculatum* nov. spec.

28. Hinterleib einfarbig schwarz 29.

— Endsegmente rot 35.

29. Kopfschild mit zwei langen Längskielen (Fig. 1). Lippen-taster 3gliedrig (*Pseudagris*). 3. *S. junodiana* Schulth.

— Kopfschild ohne lange Kiele 30.

30. *Synagris*. Hinterschildchen seitlich mit je einem spitzen Zahn. Ecken des Mittelsegmentes zahnartig ausgezogen. (*Paragris*) 31.

— Hinterschildchen und Mittelsegmentecke anders gestaltet; Lippentaster 4gliedrig 32.

31. Großes Tier, 25—28 mm. Ganz schwarz, auch Fühler und Beine. Kopfschild zerstreut punktiert; Fühlerhaken ♂ kurz, kaum länger als das vorletzte Glied. 2. Sternit ♀ regelmäßig gewölbt, ♂ mit zwei oft sehr kräftigen, dornartigen Fortsätzen . . . 7. *S. (Paragris) crassipes* Kohl.

- Kleineres Tier, 16—18 mm (ganze Länge). Fühler ausgedehnt orangerot. Kopfschild teilweise rot, längsrunzlig. 2. Sternit ♂ und ♀ mit einer glänzenden, glatten Längsrinne, die von scharfen Rändern eingefasst ist. Beine braun.
6. *S. (Paragris) parvula* nov. spec.

32. Hintere Hälfte der Vorder- sowie die ganzen Hinterflügel wasserhell. Kopfschild ♀ breiter als lang, unten breit und wenig tief ausgerandet. Hinterschildchenkante ähnlich gebildet wie bei *O. ventralis* (Fig. 13). Kiele des Dorsulum fehlen . . . 28. *O. schubotzianus* Schulth.

- Flügel durchweg verdunkelt. Kopfschild birnförmig, länger als breit oder, wenn breiter als lang, unten nicht oder kaum ausgerandet. Hinterschildchen anders gestaltet . . 33.

33. Kopfschild breiter als lang, unten kaum ausgerandet. Dorsulum mit 2 Längskielen. Hinterschildchen mit Mittelzahn.

27. *O. anceps* Grib. subsp. *totoniger* nov. subsp.

- Kopfschild birnförmig, gerade abgestutzt (*Montezumia bimaculata*) oder ♀ dreieckig, ♂ tief halbkreisförmig ausgerandet. Dorsulum ohne Kiele. Hinterschildchen anders gestaltet . 34.

34. Große Tiere, ♂ 18, ♀ 22 mm. 1. Abdominalsegment viel schmaler als das 2., kurz gestielt, auf der Mitte des 1. Tergits mit einem grob längsgekielten Feld. Kopfschild gerade abgestutzt. 2. Sternit mit basalem, medianem Längskiel . . . 8. *Pachymenes bipunctata* Meade Waldo.

- Kleinere Tiere bis 17 mm. 1. Abdominalsegment nicht schmaler als das 2., sitzend. Kopfschildunterrand ♂ und ♀ ausgerandet. 1. Tergit ohne geripptes Mittelfeld; 2. Sternit ohne Kiel. Habitus des *Rh. synagroides*.

21. *Rh. synagroides* Sauss. subsp. *fallax* Sauss.

35. Lippentaster 3gliedrig, lang. *Synagris*. 1. Segment vorn kuppelartig abgerundet, etwas schmaler als das 2. Mittelsegment, seitlich abgerundet wie bei *Hoplopus*. Kopfschildunterrand breit abgestutzt. Fühler des ♂ am Ende nicht hakenförmig umgebogen.

5. *Rh. vicaria* Stadelm. subsp. *luteopicta* Maidl.

- Lippentaster 4gliedrig, kurz. 1. Abdominalsegment breit, breit abgestutzt. Mittelsegmentseiten nicht abgerundet. Endglied der Fühler ♂ verdünnt und hakenförmig zurückgeschlagen 36.
36. ♂♂¹⁾ 37.
- ♀♀ 40.
37. Kopfschild und Fühler dunkel indischrot. Kopfschild ebenso breit als lang, unten tief halbkreisförmig ausgerandet. Kiefer mit tiefem Ausschnitt zwischen dem zweiten und dritten Zahn, welche sehr flach sind. Mittelsegment seitlich mit mehreren scharfen Zähnen. 21. *Rh. synagroides* Sauss.
- Kopfschild und oft auch die Fühler hell orangerot bis gelb 38.
38. Augensaum schwarz. Kopfschild deutlich breiter als lang, sechseckig. Unterrand gerade abgestutzt, so lang wie das 4. Fühlerglied. Fühlerhaken gerade, höchstens ganz schwach gebogen, stumpf 29. *O. natalensis* Sauss.
- Innerer Augensaum gelb oder rötlich. Fühler auch auf der Oberseite hellrot. Kopfschild nicht breiter als lang, birnförmig, unten mehr oder weniger deutlich ausgerandet. Fühlerhaken gebogen. 39.
39. Kopfschild - Unterrand sehr seicht dreieckig ausgerandet, kürzer als das 4. Fühlerglied. Schildchen flach, spärlich punktiert, glänzend. Hinterschildchen in derselben Ebene liegend wie das Schildchen, eine horizontale, gerade, scharfe Kante bildend. Mittelsegmentecke mit ein bis mehreren scharfen Zähnen 20. *Rh. xanthurum* Sauss.
- Kopfschild (Fig. 9b); sein Unterrand lang, eher länger als das 4. Fühlerglied, seicht bogenförmig ausgerandet. Schildchen gewölbt, sehr dicht runzlig-punktiert, mit medianer Längsfurche. Hinterschildchen quer gewölbt, in der Mitte tief eingesenkt, so daß zwei abgerundete, vorragende Höcker entstehen, deren Kante fein gezähnt ist. Mittelsegment seitlich abgerundet mit stumpfer Ecke. Fühler mit stark gebogenem, spitzem Endglied. Transvaal.
23. *Rh. ardens* Guérin.
40. Kopfschild ♀ kaum länger als breit, stark gewölbt, sehr wenig ausgerandet, mit kurzen Kielchen oberhalb der Ecken der Ausrandung. Unterrand des Kopfschildes wenig kürzer als

¹⁾ ♂ des *Rh. incensum* unbekannt.

- das 2. Geißelglied. Hinterschildchen mitten eingedrückt; seitlich zwei starke, runde Höcker bildend. Kiefertaster kräftig; ihre Glieder allmählich an Länge abnehmend (*Odynerus*). Fühler meist ganz, seltener nur auf der Unterseite hellrot. 11—14 mm. 29. *O. natalensis* Sauss.
- Kopfschild deutlich länger als breit; Unterrand desselben beim ♀ kaum so lang wie das 3. Geißelglied, jedenfalls kürzer als das zweite, leicht ausgerandet oder abgestutzt . 41.
41. Thorax unregelmäßig, ziemlich grob punktiert, glänzend; Zwischenräume zwischen den Punkten größer als diese selbst. Kopfschild, Glabella, Saum in der Augenausrandung und Fühler hell orangerot. Schildchen flach, sehr spärlich punktiert, glänzend. Hinterschildchen in derselben Ebene liegend wie das Schildchen; eine horizontale, gerade, scharfe Kante bildend. Hinterschildchenhinterfläche und Mittelsegment senkrecht abfallend; Bildung wie bei *Rh. marginellum*, *cyanopterum* etc. 1. Abdominalsegment vorn breit, seine Ecken fast rechtwinklig. 20. *Rh. xanthurum* Sauss.
- Thorax dicht punktiert; Zwischenräume zwischen den Punkten viel kleiner als diese selbst. Kopfschild, Fühler, Glabella und Augenausrandung dunkelrot oder schwarz. Schildchen sehr dicht punktiert, gewölbt, mit oder ohne mediane Längsrinne 42.
42. Kopfschild unten schwach dreieckig ausgerandet mit ganz kurzen Kielchen (Fig. 5), die von den Ecken des Kopfschildunterrandes bogenförmig nach außen und oben verlaufen. Entfernung der Spitzchen am Kopfschildunterrande viel kleiner als die Länge des 4. Fühlergliedes. Obere Kante des Mittelsegmentes scharf; an der Seite 3—4 schmale, scharfe, dornartige Gebilde. 3. Cubitalzelle verhältnismäßig schmal; ihr Radialsektor meist viel kürzer als der Endsektor der Radialader. Ost- und Westafrika.
21. *Rh. synagroides* Sauss.
- Kopfschildunterrand breiter oder ohne solche Kielchen. Kante des Hinterschildchens in der Mitte mehr oder weniger eingesenkt. Zahn an der Seite des Mittelsegmentes stumpf, einfach oder fehlend. 3. Cubitalzelle verhältnismäßig breit, ihr Radialsektor ebenso lang oder länger als der Abstand von der Vereinigung der 3. Cubitalquerader mit der Radialader bis zum Ende der Radialzelle 43.
43. Kopfschild schwarz, unterhalb der Mitte eingedrückt, ebenso hoch wie breit, sehr zerstreut mit flachen Punkten besetzt

- a. Schildchen flach, spärlich punktiert, glatt; Hinterschildchenkante geradlinig. 1. Abdominalsegment breit, vorn breit abgestutzt.

Rh. marginellum F. subsp. *xanthurum* Sauss.

- a'. Schildchen gewölbt, dicht punktiert; Hinterschildchen anders gestaltet. 1. Abdominalsegment schmaler als das 2., vorn abgerundet; *synagris*-artig.

- b. Hinterschildchen mitten eingesattelt, neben der Einsattlung buckelartig erhaben. Kopfschildunterrand relativ breit. Mittelsegment seitlich mit einfachem Zahn (Fig. 9) . . Gruppe *Rh. ardens* Guérin.

- b'. Hinterschildchen mitten nicht eingesenkt, ohne seitliche Höcker.

- c. Abdomen schwarz oder die Endsegmente rot (oder weiß?). Mittelsegment seitlich mit mehreren spitzen, schmalen Zähnen.

Gruppe *Rh. synagroides* Sauss.

- c'. Abdomen mit ganzen oder unterbrochenen hellen Binden oder Flecken, meist schon auf den vorderen Segmenten *Rh. grayi* et *similia*.

- B'. Kiefertasterglieder allmählich an Länge abnehmend.

Odynerus Latr.

- a. Dorsulum mit erhabenen Längskielen (Fig. 13); Hinterschildchen quer geradlinig mit vorspringendem Mittelzahn. Mittelschenkel ♂ verbreitert, an der Unterseite ausgehöhlt.

- b. Kleinere Tiere, 8—15 mm. Abdomen ganz rot.

O. carinulatus Sauss.

- b'. Größere Tiere. Basale Segmente schwarz.

- c. Kopfschild gerade abgestutzt.

O. ventralis Sauss.

O. anceps Gribodo.

- c'. Kopfschild unten ausgerandet.

O. magretti Gribodo.

- a'. Dorsulum ohne Längskiele. Mittelschenkel ♂ ohne Auszeichnung *O. natalensis* Sauss.

Färbungsparallelismus bei verschiedenen Arten.

	Endsegmente rot	Endtergite weiß	Alle Segmente schwarz	Segmente teilweise gefleckt
<i>Synagris (Pseudagris)</i>	<i>carinata</i> Sauss.	<i>albicauda</i> Schulth.	<i>junodiana</i> Schulth.	
<i>(Rhynchagris)</i>	<i>luteopicta</i> Maidl	<i>vicaria</i> Stadelm.		
<i>Rhynchium synagroides</i> Sauss.	<i>synagroides</i> Sauss.		<i>fallax</i> Sauss.	<i>aurumaculatum</i> Sauss.
<i>incensum</i> Grib.	<i>incensum</i> Grib.			
<i>ardens</i> Guérin	<i>ardens</i> Guérin	<i>junodi</i> Grib.		
<i>Odynerus ventralis</i> Sauss.	<i>ventralis</i> Sauss.			
<i>magretti</i> Grib.	<i>magretti</i> Grib.			
<i>anceps</i> Grib.	<i>anceps</i> Grib.	<i>albofasciatus</i> Schulth.	<i>totoniger</i> Schulth.	
<i>natalensis</i> Sauss.	<i>natalensis</i> Sauss.			

Bemerkungen zu den einzelnen Arten.

NB. Betr. Literaturangaben wird verwiesen auf Bequaert, Bull. Amer. Mus. Nat. Hist. 1918, XXXIX, S. 266 ff.

I. *Synagris* Latr.

1. *S. (Pseudagris) albicauda* Schulth.

= *Rhynchium abyssinicum* Sauss. var. *albicauda* Schulth., 1923
Verh. zool.-bot. Ges. Wien S. 1.

♂, ♀. Omnino uti *S. carinata* Sauss.; abdominis tergita duo vel tria ultima eburneo-maculata vel fasciata.

♂. Feminae similis. Clypeus quam in femina apice valde angustior; antennae uncinatae; uncus gracilis, longus, incurvus, fere medium articuli 10. attingens. Fig. 1, 2.



Fig. 1. *Pseudagris*.
Kopfschild ♀.



Fig. 2. *Synagris albicauda* Schulth.
Fühlerende des ♂.

Long. corp. tot. ♀ 18—22 mm, ♂ 13 mm; alae ♀ 16—18 mm, ♂ 10 mm.

4 ♂, 6 ♀, NO.-Rhodesia, Ost-Loangwe, Chinseli, Bangweolosee 2400—4200 Fuß, II.—VI.; Nyassasee, Neave leg., Neu-Helgoland XII. 99, Kigonsera (c. m., Mus. Oxford, Mus. Berlin).

Das ♂, das erste, das vom Subgenus *Pseudagris* bekannt wird, stimmt plastisch vollständig mit dem ♀ überein. Der Kopfschild ist genau gestaltet wie beim ♀; nur ist er unten leicht abgerundet, nicht quer abgestutzt; da nur etwa halb so breit als beim ♀, kaum länger als das 1. Geißelglied. Das vorletzte Fühlerglied ist sehr kurz und dünn, das letzte hakenförmig umgebogen, lang, schlank, leicht gebogen und scharf zugespitzt; es erreicht mit der Spitze fast die Mitte des 10. Gliedes.

Die Verteilung der schwarzen und rotbraunen Farbe ist genau die gleiche, wie sie Maidl für *S. carinata* und *aterrima* angibt. Der Unterschied besteht einzig darin, daß *albicauda* auf den 2—3 letzten Tergiten elfenbeinweiße Zeichnungen zeigt, die bald als breite, ganze, bald als mitten unterbrochene oder seitlich abgekürzte Binde erscheint. Tergit 4 oder 6 sind bald weiß

gezeichnet, bald ganz schwarz. Bei den vorliegenden ♀ trägt Tergit 5—6 eine breite ununterbrochene Binde; die übrigen Tergite sind schwarz.

Da bei allen Arten der Untergattung *Pseudagris* die plastischen Merkmale dieselben sind, könnte es nahe liegen, sie als Farbenvarietäten einer einzigen Art aufzufassen; doch zeigt das Fühlerendglied des Mannes nicht unbeträchtliche Verschiedenheiten:

albicauda hat einen langen, sehr spitzigen Fühlerhaken;
bei *aterrima* ist er dicker und am Ende stumpf;
carinata hält die Mitte, und von
versicolor ist das ♂ nicht bekannt.

3. *S. (Pseudagris) junodiana* Schulth.

1899 *Rh. junodianum* Schulth., Bequ. l. c. p. 302, no. 95.

1913 *Rh. tessmannianum* Schulth., Bequ. l. c. p. 313, no. 181.

1914 *Synagris aterrima* Maidl, Bequ. l. c. p. 318, no. 1.

1895 (?) *Rh. holomelas* André, Bequ. l. c. p. 301, no. 84.

5. *S. (Rhynchagris) vicaria* Stadelmann.

S. vicaria Stadelm., Bequ. l. c. p. 318, no. 4.

= *Rhynchium hoplopoides* Schulth., 1923 Verh. zool.-bot. Ges. Wien S. 1. Fig. 3.

Eine Anzahl der mir vorliegenden Männchen zeigt eine eigentümliche Bildung an den Sterniten, deren Maidl in seiner Monographie der Gattung *Synagris* nicht Erwähnung tut. Die Sternite 3—6 tragen einen erhabenen Längskiel, der das Ende des Sternites in Form eines kurzen Dornes um ein wenig überragt. Dieser Dorn ist eingehüllt in eine dichte Flocke goldgelber, lockiger Haare, die aber oft abgerieben sind.



Fig. 3.
Synagris vicaria Stadelm. ♂.

6. *S. (Paragris) parvula* nov. spec.

♂, ♀. *Parvula*, *nigra*, *antennis*, *scapo supra nigro excepto*, *laete rufis*. *Orbita inferior et clypeus maris flavi*. *Tibiae et tarsi fusi*. *Sternitum 2. maris et feminae rima longitudinali instructum*. *Alae valde infumatae, violasceo-micantes*. *Long. corp. (usque ad marg. post. terg. 2.)*. ♂ 14, ♀ 17 mm.

Zentralafrika, Belg. Kongo, Urwald Beni (Grauer leg. 1910).
1 ♂, 1 ♀ Mus. Wien.

Kopf und Thorax sehr dicht und sehr kurz braun borstig behaart, dicht und fein punktiert. Kiefer lang mit 4 stumpfen Zähnen. Kopfschild beträchtlich länger als breit, beim ♀ dicht und grob, beim ♂ viel weniger deutlich längsgerunzelt; zwischen den Runzeln sehr dicht und fein punktiert. Kopfschildunterrand gerade abgestutzt, so lang wie das 3. Geißelglied (Fig. 4). Zwischen den Fühlern ein sehr scharfer Grat. Ocellen in fast gleichseitigem Dreieck, hintere viel weniger weit voneinander entfernt als vom Netzauge. Entfernung der Netzaugen auf dem Scheitel gleich groß wie diejenige am Fühleransatz. Hinter den Nebenaugen eine behaarte Grube. Pronotum scharf gerandet; Seitenecken abgerundet. Flügelschuppen matt, sehr fein punktiert, ohne grobe Punkte. Schildchen stark gewölbt, mitten vertieft, so daß, besonders beim ♀, zwei seitliche Höcker entstehen. Hinterschildchen wie bei den übrigen *Paragris*-Arten. Mittelsegmenthinterfläche mit diagonal verlaufenden Runzeln. Backen des Mittelsegmentes sehr grob runzlig punktiert. Mittelsegmentseitendorne nur schwach entwickelt. Mesosternum auf dem Episternum dicht, auf dem Sternum ziemlich zerstreut punktiert. Flügel und Beine nichts Besonderes; Hinterhüften hinten mit Zahn. Abdomen sehr zerstreut und seicht punktiert. 2. Sternit zerstreut punktiert, in der Medianlinie eine glatte, glänzende Grube, deren Breite ungefähr der Länge des 2. Fühlergeißelgliedes entspricht und die seitlich durch einen aufgeworfenen, sehr scharfen Rand begrenzt ist.

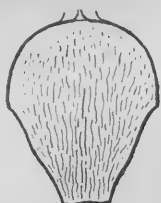


Fig. 4.
Synagris parvula
Schulth.
Kopfschild ♀.

♂ dem ♀ ähnlich. Kopfschildunterrand leicht ausgerandet. Fühlerhaken lang, scharf zugespitzt, mitten fast rechtwinklig gebogen. 2. Sternit wie beim ♀ gebildet.

Ganz schwarz. Rot sind: die Fühler, mit Ausnahme der Oberseite des Fühlerschaftes; dunkelrot die Basis des Kopfschildes beim ♀; gelblichrot der Kopfschild des ♂, sowie der innere Augensaum bei ♂ und ♀. Flügel stark verdunkelt, violett schillernd. Schienen und Tarsen rotbraun.

S. parvula ist neben *Pseudagris junodiana* Schulth. (= *aterrima* Maidl) und *Paragris crassipes* Kohl die einzige bekannte ganz schwarze Art. Von ersterer ist sie als echte *Paragris* leicht zu unterscheiden, von *crassipes* durch die Größe, die roten Fühler, den langen Fühlerhaken, die Bildung des Kopfschildes und des 2. Sternits.

II. *Pachymenes* Sauss.

8. *Pachymenes bipunctata* Meade Waldo,

1911 Ann. Mag. Nat. Hist. (8) VIII, p. 455, ♀,

1923 Schultheß, Verh. zool.-bot. Ges. Wien S. 4, ♂, ♀,

ist sicherlich keine *Montezumia*; denn die Lippentaster sind 4- und die Kiefertaster 6gliedrig, wobei die drei letzten Glieder kurz und zusammen kaum so lang sind wie das 3. Glied; aber es ist wohl auch kein *Rhynchium*, wie ich 1923 annahm, sondern eher eine *Nortonia* Sauss. resp. *Pachymenes* im Sinne Bequaerts, obgleich das Abdomen bei unserer Art etwas weniger lang gestielt ist als bei den meisten anderen *Pachymenes*-Arten.

III. *Rhynchium* Spin.

11. *Rh. grayi* Sauss.

Bequ. l. c. p. 299, no. 74.

= *Rh. neavei* Meade Waldo, Bequ. l. c. p. 299, no. 74a.

= *Rh. usambaraense* Cam. ♀, Bequ. l. c. p. 300, no. 74d.

Voraussichtlich sind auch die folgenden Arten No. 12 und 13 als var. zu *grayi* aufzufassen.

12. *Rh. denticulatum* Mocs.

S. denticulata Mocs., 1903 Ann. Mus. Nat. Hungar. I, p. 506.

Rh. denticulatum Maidl, Denksch. k. Acad. Wiss. Wien. math. naturw. Kl. XCI, 1914, S. 316.

Ukami, Deutsch-Ostafrika.

13. *Rh. usambaraense* Cam.

Rh. usambaraense ♂ Cam., 1913 Wiss. Ergebn. Schwed. zool.

Exp. Kilimandjaro II, 8, 6, S. 183 mas.

Bequ. l. c. p. 300, no. 74d.

14. *Rh. proserpina* Schultheß.

1923 Verh. zool.-bot. Ges. Wien S. 2.

Parvum, nigrum, rufo-varium, alis infuscatis, tergitis 3.—6. (♂) fasciis latis, medio late interruptis albis ornatis. ♂ 11 mm.

Caput et thorax densissime, minus grosse et profunde punctata, abdominis tergum 1. disperse sed profunde, cetera densius sed minus profunde punctata. Clypeus quam latior altior, piriformis, disperse punctatus, ejus margo inferior vix longior quam articuli antennarum 4. dimidia pars, truncatus, quarta parte inferiore sulcatus. Antennarum uncus cylindricus rectus, obtusus. Tegulae subtilissime punctulatae. Scutellum planum; postscutellum supra

planum, rotundatum. Segmenti mediani facies postica bene limitata, polita, rugis diagonaliter dispositis ornata; canthi acuti, non elevati; angulus lateralis discretus sed non spiniformis. Mesopleurae dense punctatae; latera segmenti mediani longitudinaliter striatae. Sternitum 2. politum, disperse punctatum, medio fossa impressa instructum.

Nigrum; rufi sunt: antennae, macula lateralis pronoti et segmenti mediani et pleurae, pedes et sternitum 1.; eburnei sunt: Clypeus, glabella, fasciae latae, medio late interruptae tergiti 3.—6.

Rh. proserpina ist, was die Zeichnung anbetrifft, eine Miniaturausgabe der *Synagris proserpina* Gribodo, besonders deren var. *niassae* Stdm. Der Bau der Kiefertaster weist das Tier in die Gattung *Rhynchium*.

Kopf, Thorax und Abdomen dicht gleichmäßig punktiert; Kopfschild schmal und lang; sein Unterrand kurz, kaum länger als das halbe 4. Fühlerglied, abgestutzt; das untere Drittel des Kopfschildes trägt eine tiefe mediane Längsrinne. Fühlerhaken schlank, zylindrisch, gerade, stumpf, erreicht die Basis des 10. Gliedes. Flügelschuppen sehr fein, dicht punktiert. Schildchen leicht gewölbt, Hinterschildchen fast in derselben Ebene liegend, abgerundet, ohne scharfe Kante; Mittelsegmenthinterfläche ziemlich tief, glänzend, diagonal gerunzelt, deutlich abgegrenzt, aber ohne Seitenzahn. Mesopleuren wie das Dorsulum punktiert, Seiten des Mittelsegmentes fein längsgerunzelt. Flügel mäßig verdunkelt, violett schillernd. Beine ohne Auszeichnung. Abdomen dicht punktiert, besonders auf Tergit 2 und den folgenden. Gegen das Ende von Tergit 1 findet sich eine flache Vertiefung, wo die Punktierung gröber und dichter ist; dasselbe ist der Fall auf dem Hinterrande von Tergit 2. Sternit 2 zerstreut punktiert, glänzend, mit einer medianen, seitlich nicht scharf abgegrenzten Grube.

Schwarz; rot sind: Die Fühler, ein paariger Fleck auf dem Pronotum, die Mesopleuren, die Seiten des Mittelsegmentes, die Beine und das 1. Sternit; weiß sind: der Kopfschild, ein Fleck zwischen den Fühlern, große Seitenflecke auf Tergit 3—6, welche einen ca. ebenso großen schwarzen medianen Zwischenraum zwischen sich lassen.

1 ♂ N.-O.-Rhodesia, Unt. Kalungwisital „im dichten Walde“, 3500 Fuß (S. A. Neave leg. 16. Sept. 1908) (Mus. Oxford, Type).

Ein zweites ♂ vom selben Fundort weicht vom Typus dadurch ab, daß das Mittelsegment unterhalb der Seitenecke einen starken, hakenförmig nach unten gebogenen Dorn trägt.

Als Var. zu *Rh. grayi* kann *Rh. proserpina* aus folgenden Gründen nicht aufgefaßt werden:

	<i>Rh. grayi</i> ♂.	<i>Rh. proserpina</i> ♂.
Größe:	14—16 mm.	11 mm.
Fühlerhaken:	stark gebogen.	gerade zylindrisch.
Mittelschenkel:	unten nahe der Basis stark ausgehöhlt; mitten verbreitert, ähnlich <i>O. anceps</i> .	höchstens leicht ab- geflacht.
Mittelsegmentseiten:	zerstreut punktiert ohne deutliche Runzeln.	deutlich, ziemlich regelmäßig längs- runzlig.

15. *Rh. osborni* Bequ.

Bequ. l. c. p. 141, Taf. 1 fig. 4.

♀. Niger; rufo-ferruginei sunt: mandibularum apex, clypeus, antennarum scapus, flagellum subtus, pronotum, tegulae, maculae magnae mesopleurales et pedes cum coxis. Albi sunt: parategulae, squamae inter postscutellum et alarum basim et macula segmenti mediani. Laete straminei sunt: maculae rotundae laterales tergitorum 1. ad 5. Alae valde infumatae, luxuriose aureomicantes. Long. corp. (usque ad marg. post. tergiti 2.) $10\frac{1}{2}$ mm.

Belg. Kongo: Kindu, Prov. Maniema, 1 ♀ (L. Burgeon, 1917) (Mus. Paris). Urwald Moera, westlich Tanganyikasee, 1 ♀ (Grauer leg. 1910) (Mus. Wien).

♀. Kopf und Thorax kurz abstehend rotbraun behaart. Kopf überall grob und dicht runzlig punktiert; nur der Raum zwischen den Fühleransätzen glatt. Kiefer lang, mit deutlichen breiten Zähnen, wie bei *Rh. synagroides*. Kiefertaster kurz und dick, wie bei *Rh. grayi* und *aestuans*. Kopfschild birnförmig, länger als breit, sehr grob runzlig punktiert, mit zwei scharfen, unten leicht gebogenen Kielen, die bis wenig über die Mitte des Kopfschildes hinaufreichen. Unterrand gerade abgestutzt, so lang wie das 3. Geißelglied. Zwischen den Fühlern ein scharfer Kiel, an den sich nach oben eine plattenförmig abgehobene Glabella anschließt. Schläfen scharf gerandet. Nebenaugen in flachem Dreieck; die hinteren ebensoweit voneinander abstehend als vom Netzauge: hinter den Nebenaugen eine behaarte Grube. Thorax wenig länger als breit, etwas feiner, aber ebenso dicht punktiert wie der Kopf, vorn scharf gerandet, ohne Seitenecken. Tegulae matt, ohne grobe Punkte. Schildchen und Hinterschildchen wie das Dorsulum punktiert; ersteres mäßig gewölbt, vorn mit glatter Mittellinie, die gegen den Hinterrand etwas eingesenkt ist. Hinterschildchen

kurz, hinten steil abfallend, mit fein crenulierter, mitten nicht vertiefter Kante. Hinterfläche glatt und glänzend. Mesopleuren grob und dicht runzlig punktiert. Metapleuren sehr fein nadelrissig. Seiten des Mittelsegmentes fein längsgerunzelt, oben und nach hinten mit groben Punkten besetzt. Mittelsegmenthinterfläche breit, mäßig vertieft, mit mäßig groben diagonalen Runzeln; obere Kante scharf, seitlich mit mehreren stumpfen Zähnen bewehrt. Flügel und Beine nichts Besonderes. Tergite mit feinem, schwarzem Toment bedeckt, mäßig dicht und grob punktiert. 2. Sternit glänzend, zerstreut und gleichmäßig punktiert; gegen die Basis mit leichter Vertiefung.

Relativ kleines Tier, hauptsächlich ausgezeichnet durch seine auffallende Färbung. Kiefer, Kopfschild, Glabella, Fühlerschaft, Unterseite der Geißel, Pronotum, Mesopleuren, Tegulae und Beine rotbraun; Parategulae, Schuppen zwischen dem Hinterschildchen und dem Ansatz der Hinterflügel und je ein Fleck auf der Oberseite des Mittelsegmentes weiß; Tergite 1—5 jederseits mit einem randständigen, runden, von vorn nach hinten an Größe abnehmenden gelblichen Flecke. Flügel stark verdunkelt, goldig schillernd. Bildung des Kopfschildes, des Schildchens, Hinterschildchens und Mittelsegmentes wie bei *Rh. grayi*, *aestuens* etc.

17. *Rh. rufonigrum* Bequ.

Bequ. l. c. p. 164, fig. 174—177.

♂, ♀. *Rh. nilotico* colore valde similis. Niger; aurantiaci sunt: Clypeus, antennae, glabella, macula temporum, pronotum, tegulae, parategulae, scutella, mesopleurae, segmentum medianum, tergum 1. abdominis et pedes cum coxis. Alae atque in basi violaceae, aureo-cyaneo-micantes. Long. corp. (usque ad marg. post. terg. 2.). ♂ 12, ♀ 13—14 mm.

Var. Pronotum, scutellum pro parte nigrum. Tergum 1. supra medio nigrum.

Zentral- und West-Afrika; Franz. und Belg. Kongo, Lambarene am Ogowe, 1 ♂ (Ellenberger leg. 1911) (Mus. Paris); Biefra 1 ♀ (c. m.); Belg. Kongo, Kondué, 1 ♀ (Luja leg.) (c. m.), Urwald Moera westl. Tanganyikasee (Grauer leg. 1910 1 ♀) (Mus. Wien).

Rh. rufonigrum ist dem *Rh. niloticum* Sauss. (Saussure, Et. III, pl. XVI, fig. 8) zum Verwechseln ähnlich. Die Unterschiede sind in der Tabelle niedergelegt. Kopf und Thorax überaus kurz borstig schwarz behaart, sehr dicht ziemlich grob runzlig punktiert, deutlich feiner als *niloticum*. Kiefer mit 4 stumpfen Zähnen, beim ♂ ohne Ausrandung zwischen den Zähnen. Kopfschild birnförmig, länger als breit, im oberen Drittel am breitesten, ziemlich stark

gewölbt, längsgerunzelt und grob punktiert; Unterrand gerade abgestutzt, so lang wie das 4. Fühlerglied. Zwei scharfe, nach außen konvexe Kielchen reichen vom Unterrand bis zum Beginn des mittleren Drittels des Kopfschildes. Zwischen den Fühlern ein scharfer Längskiel. Hintere Nebenaugen etwas weniger weit voneinander entfernt als vom Netzauge. Am Hinterkopf eine runde Grube. Thorax länger als breit, vorn scharf gerandet; Seitenecken stumpf. Punktierung wie am Kopf. Flügelschuppen sehr fein punktiert, höchstens am Vorderrande mit ganz vereinzelten größeren Punkten. Schildchen und Hinterschildchen geneigt; letzteres beim Übergang in die geneigte Hinterfläche sehr fein gezähelt; Kante im Querprofil gebogen, d. h. mitten höher als seitlich. Mittelsegmentoberkante kaum angedeutet, eher abgerundet zu nennen. Seiten- und Unterkante mit mehreren, mehr weniger scharfen Zähnen bewehrt. Mittelsegmenthinterfläche ♀ nicht, ♂ fein diagonal gerunzelt. Mesopleuren grob runzlig punktiert, gröber als das Dorsulum. Metapleuren fein nadelrissig. Mittelsegmentseiten mit feinen, diagonal verlaufenden Runzelstreifen und einzelnen groben Punkten. Flügel und Beine nichts Besonderes. Hinterhüften hinten ohne Zahn. Abdomen oben und unten mäßig dicht und grob punktiert; 2. Sternit mit flacher Grube.

Betr. Färbung stimmt *Rh. rufonigrum* mit dem *Rh. niloticum* Sauss. im ganzen überein. Die Fühler sind ganz orangerot (bei *niloticum* wenigstens vom 4. Gliede an oben und unten schwarz). Kopfschild ♂ und ♀ orangerot, Glabellarfleck klein, Augensaum schwarz (bei *niloticum*: Glabellarfleck sehr groß; Orbita und Augenausrandung ♀ orangerot, ♂ wie der Kopfschild hellgelb). Mesopleuren ganz orangerot (*niloticum* nur deren obere Hälfte). Beim vorliegenden Männchen ist das 1. Tergit nicht vollständig rot, sondern die rote Farbe ist durch einen schwarzen Medianstreif in zwei große runde Flecke aufgelöst. Stücke mit roten Seitenflecken auf dem 2. Tergit liegen nicht vor, wie sie bei *niloticum* vorkommen. Die Flügel sind von der Basis an verdunkelt; bei *niloticum* ist die Basis bis zum Beginn der Mittelzelle, sowie der Hinterrand der Hinterflügel hell.

Var. Ein ♀ aus dem Urwald Moera ist stark verdunkelt, indem die Unterhälfte des Kopfschildes, die Seiten des Pronotums, die Mitte des Schildchens und des 1. Tergits schwarz sind.

19. *Rh. sulphureomaculatum* nov. var. an nov. spec.

Rh. sulphureomaculatum ist wahrscheinlich als einfache Varietät des *Rh. auromaculatum* Sauss. aufzufassen. Da es aber doch nicht nur in der Färbung, sondern auch dadurch abweicht, daß die

Mittelsegmentseiten abgerundet sind und nicht die für *Rh. synagroides* Sauss., als dessen Subspecies ich das *Rh. auromaculatum* ansehe, so charakteristischen scharfen Zähne tragen, so möchte ich es doch vorläufig mit eigenem Namen versehen, bis durch die Kenntnis des Männchens seine Stellung klargestellt ist.

Die Flecken des 2. Tergits sind nicht dunkel orangerot, sondern hellgelb, mitten nicht getrennt, sondern konfluierend; die Fühler sind ganz rot, bei *auromaculatum* meist ganz schwarz oder wenigstens nur unten rot; die Glabella ist hellgelb, bei *auromaculatum* schwarz; die Beine bei einem Exemplar ganz rot, bei den anderen teilweise schwarz. Die Seiten des Mittelsegmentes sind bei zweien der drei vorliegenden Exemplare vollständig abgerundet, beim einen ist ein kleiner, nach unten gerichteter Zahn vorhanden. Männchen unbekannt.

Belgischer Kongo, Urwald Moera westlich vom Tanganyikasee
3 ♀ Grauer leg. 1910 (c. m.; Mus. Wien).

20. *Rh. xanthurum* Sauss.

Rh. xanthurum Sauss., Et. Fam. Vespides III, 1856, p. 182, ♀.

— Mém. Soc. Phys. et Hist. nat. Genève 1. c. p. 209, ♂, ♀.

— Grandidier, Madagaskar XX, 1891, p. 173, T. 4 f. 12, ♂, ♀.

Rh. xanthurum gehört zwar wohl der Färbung, nicht aber dem Körperbau nach zu den synagroiden Arten. Es zeigt die Formen der echten Rhynchien (*haemorrhoidale* Fab., *cyanopterum* Sauss.) mit konischem, nach vorn nicht verschmälertem, daher nicht eiförmigem Abdomen. Das 1. Abdominalsegment von oben gesehen ist ebenso breit wie das 2.; seine Seiten sind parallel; der Vorderrand bildet einen flachen Bogen, während das 1. Segment bei den Synagroiden schmaler ist als das 2. und seine seitliche und vordere Begrenzung sich der Elipse nähert.

Thorax dicht, borstig, schwarz behaart, ziemlich zerstreut, seicht punktiert; Dorsulum vorn ohne Spuren eines Längskiels, seine Mitte oft fast punktlos, glänzend; Schildchen flach, mit dem Dorsulum und dem Hinterschildchen in einer Ebene liegend, wie die Mitte des Dorsulums zerstreut punktiert mit seichter Längsrinne. Hinterschildchen eine horizontale Fläche bildend, mit scharfer Kante von der senkrecht abfallenden Hinterfläche getrennt. (Bei den Synagroiden ist der Thorax viel weniger stark behaart, überall äußerst dicht und tief punktiert, auf dem Schildchen und dem Hinterschildchen noch gedrängter als auf dem Dorsulum; letzteres vorn mit einem erhabenen punktlosen Mittelkiel, der nicht ganz bis zur Mitte reicht. Schildchen gewölbt, durch eine Mittellängsfurche in zwei wenig erhabene Höcker ge-

teilt, nach rückwärts geneigt. Hinterschildchen noch tiefer liegend als das Schildchen, leicht zweihöckrig, nach den Seiten abfallend, d. h. von hinten gesehen einen Bogen bildend.) Hinterfläche des Hinterschildchens glatt, glänzend, sowie das Mittelsegment steil abfallend; obere Kante abgerundet, untere Kante scharf mit scharfen Seitenzähnen. 2. Sternit zerstreut punktiert, glänzend.

Kopfschild des ♀ birnförmig, $\frac{1}{6}$ höher als breit, punktiert und längsrunzlig, unten in zwei Spitzchen auslaufend, die genau um die Länge des 4. Fühlergliedes voneinander abstehen. Unter- rand zwischen den Spitzchen leicht ausgerandet. Kopfschild des ♂ heller gefärbt, viel weniger stark skulpturiert, im übrigen wie beim ♀. Fühlerhaken des ♂ leicht in der Längsachse der Fühler gebogen, gegen die Spitze dünner werdend, erreicht die Mitte des 10. Gliedes.

Schwarz, Kiefer dunkel kupferrot; Kopfschild, Oberlippe, Glabella, innerer Augensaum bis auf den Grund der Augen- ausrandung, Fühler, ein Fleck hinter den Augen, die drei resp. vier letzten Abdominalsegmente, sowie der Endrand des 3. Tergits und die Vorderschienen und Tarsen orangerot. Mittel- und Hinter- tarsen, wenigstens deren letzte Glieder, rot. Flügel dunkelviolett schillernd. 3. Cubitalzelle ziemlich breit, nicht doppelt so lang als breit.

Südafrika, Caffraria (Sauss.), Kapland (Mus. Berlin, c. m.). Scheint selten zu sein.

21. *Rh. synagroides* Sauss.

Bequ. l. c. p. 312, no. 179.

Da mehrere, bis anhin als besondere Arten beschriebene Tiere sich nur durch die Farbe, aber weder durch Größe noch Struktur, noch Skulptur, noch Form des Kopfschildes oder der Schildchen oder des Mittelsegmentes, noch auch der männlichen Fühler oder Genitalien unterscheiden, so fasse ich sie als Farbenvarietäten oder Subspecies auf.

Drei basale Abdominalsegmente schwarz; drei apicale Segmente rot: var. *synagroides* Sauss.

Zwei basale Segmente schwarz; vier apicale rot: var. *alpha* Schulth.

Zwei basale und die basale Hälfte des 3. Segmentes schwarz; übrige Segmente rot: var. *beta* Schulth.

Vier basale Segmente schwarz; übrige rot: var. *gamma* Schulth.

Alle Segmente schwarz; 2. mit zwei großen roten Flecken: var. *aurumaculatum* Sauss.

Alle Segmente schwarz: var. *fallax* Sauss.

Schwarz, kurz schwarz behaart; Kiefer dunkelrot bis schwarz. Kopfschild, Fühlerschaft, Unterseite der Fühlergeißel, Glabella ganz oder teilweise dunkelbraun. Hintere Abdominalsegmente (vgl. Varietäten) hellrostrot mit gold- bis messinggelbem, oft auch silberglänzendem Tomente bedeckt. Beine dunkel; Vordertarsen oft rötlich. Flügel stark verdunkelt, violett schillernd; 3. Cubitalzelle relativ schmal, fast doppelt so lang als breit. Kopfschild ♀ birnförmig, wenig länger als breit, stark gewölbt, ziemlich dicht längsrunzig punktiert (Fig. 5); Unterrand schmal, kürzer als das 4. Fühlerglied, seicht rund oder eckig ausgebuchtet; von den Ecken des Unterrandes gehen zwei kurze Kielchen nach oben, die aber das untere Fünftel des Kopfschildes nach oben nicht überschreiten. Zwischen diesen Kielchen eine vertiefte Grube. Hinter den Ocellen eine tiefe borstentragende, oft auch kahle Grube. Thorax sehr dicht, ziemlich fein, aber tief punktiert; Dorsulum vorn mit einer glatten, erhabenen, medianen Längslinie, die kaum bis zur Mitte reicht, aber auch ganz fehlen kann. Flügelschuppen äußerst fein punktiert, mit sehr vereinzelt groben

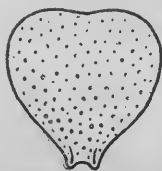


Fig. 5.
Rh. synagroides
Sauss.
Kopfschild ♀.



Fig. 6.
Rh. synagroides
Sauss.
Fühlerende ♂.

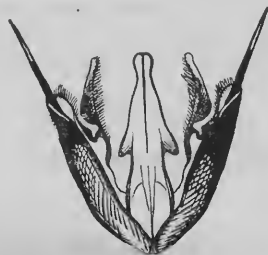


Fig. 7. *Rh. synagroides* Sauss.
Genitalanhänge ♂.

Punkten. Schildchen noch dichter und gröber punktiert als das Dorsulum, ziemlich stark gewölbt, nach hinten geneigt, mit medianer glatter Längsfurche; Hinterschildchen ebenso punktiert, leicht zweihöckrig, geneigt, ohne deutliche Kante, Mittelsegmentmitte ziemlich stark ausgehöhlt, grob diagonal gerunzelt, obere Kante abgerundet, untere scharf gezähnt; Ecke mit drei bis vier scharfen Zähnen, die aber (nach Saussure) auch ganz fehlen können. Oberseite der Backen des Mittelsegmentes äußerst dicht und grob runzig punktiert.

Die Breite des Kopfschildes beim ♂ beträgt $\frac{5}{6}$ der Höhe; er ist ziemlich stark gewölbt, unten tief halbkreisförmig ausgerandet; die Entfernung der scharfen Spitzchen ist gleich der Länge des 4. Fühlergliedes; Fühlerhaken zylindrisch, stumpf, in

der Richtung der Fühlerlängsachse gebogen, mit dem Ende bis zum Ende des 10. Fühlergliedes reichend. Kiefer nahe der Basis mit tiefer, breiter Lücke am Innenrande. (Fig. 6, 7.)

Verbreitet durch das ganze tropische und südliche Afrika, von Aden bis zum Kapland sowohl in West- als in Ostafrika. *Synagroides* ist weitaus die häufigste Art. Auch die Verbreitung der Unterarten ist eine sehr ausgedehnte.

22. *Rh. incensum* Gribodo.

Rh. incensum Grib., Mem. Acad. Sc. Ist. Bologna l. c. p. 341.

Rh. incensum zeichnet sich durch das schwarze Gesicht aus; Kiefer, Oberlippe, Kopfschild, Glabella ganz schwarz. Fühlerschaft und Unterseite der Geißel rot. Der Kopfschild ist genau so hoch wie breit, etwas kürzer als bei *synagroides* und weniger stark gewölbt, ziemlich flach, unterhalb der Mitte mit einer flachen Grube versehen. Die Entfernung der Zähnchen am Unterrande ist um die Hälfte größer als bei *synagroides*, ebenso groß wie das 4. Fühlerglied. (Fig. 8.) Das Hinterschildchen ist in der Mitte mehr weniger variabel, eingesenkt, daher zweiköckrig. Mittelsegment seitlich mit ein bis mehreren Dornen. Die vier letzten Segmente des Abdomens hell orangerot. Beine schwarz. Basale Grube des 2. Sternits tief, glänzend, fast punktlos, scharf gerandet.

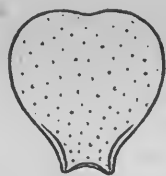


Fig. 8.

Rh. incensum Grib.
Kopfschild ♀.

Natal, Pinetown, 3 ♀; ♂ unbekannt.

23. *Rh. ardens* Guérin

kommt in zwei Formen vor:

Endsegmente rot Subsp. *ardens* Guérin.
Endtergite vom 4. oder 5. an weiß Subsp. *junodi* Grib.

23a. *Rh. ardens* subsp. *ardens* Guérin.

= *Rh. abyssinicum* Sauss.

Bequ. l. c. p. 293, no. 22.

Von dieser, offenbar recht seltenen Art habe ich nur 4 ♀ gesehen, worunter die beiden typischen Stücke, *Rh. ardens* Guérin und *Rh. abyssinicum* Sauss., beide aus Abessinien. Ihre Kenntnis verdanke ich der Freundlichkeit des Herrn L. Berland am Museum Paris, ebenso diejenige des Männchens Herrn Professor Gestro, dem Direktor des Museo civico di Storia naturale in Genua, wohin das Tier aus Gribodos Sammlung kam. Ein weiteres

Männchen liegt mir vor aus Pretoria in Transvaal, dessen Beschreibung unten folgt.

Das Charakteristische der Art liegt weniger im Vorhandensein von Kielen auf der Fläche des Kopfschildes, die beim Exemplar *abyssinicum* ziemlich deutlich, beim Exemplar *ardens* kaum wahrnehmbar sind, als in der Form und Skulptur des Kopfschildes, sowie seinem breiten, seicht ausgerandeten Unterrand. Immerhin ist deutlich eine mittlere flache Partie wahrnehmbar, die von den seitlichen abschüssigen Partien durch eine mehr oder weniger deutliche Kante getrennt ist. (Fig. 9a.)

Das Schildchen ist flacher als bei *synagroides*; das Hinterschildchen zeigt eine ausgesprochene Kante, so daß deutlich eine obere und eine hintere Fläche des Hinterschildchens zutage tritt. Beide Schildchen seichter und feiner punktiert als bei *synagroides*.



Fig. 9a.
Rh. ardens Guér.
Kopfschild ♀.



Fig. 9b.
Rh. ardens Guér.
Kopfschild ♂.



Fig. 10.
Rh. ardens Guér.
Fühlerende ♂.

Die Kante des Hinterschildchens ist in der Mitte eingesenkt, so daß zwei vorspringende, abgerundete Höcker (Mammelons) entstehen. Mittelsegmentkanten wie bei *Rh. incensum*; obere abgerundet, untere schwach gesägt; beim Zusammentreffen der beiden Kanten ein einzelner, breiter, starker, zahnartiger Vorsprung. 3. Cubitalzelle relativ breit, nicht doppelt so lang als breit; der Radialsektor der 3. Cubitalzelle länger als das Sektorstück vom Eintreffen der 3. Cubitalquerader bis zum Ende der Radialzelle. Der Verlauf des Flügelgeäders scheint übrigens sehr zu variieren.

Schwarz, kurz schwarz behaart, matt; Kiefer, Kopfschild, Glabella, innerer Augensaum, Fleck hinter den Augen, Unterseite der Fühler und Schenkel dunkel indischrot. Ein seitlicher Fleck auf dem Pronotum und einer unter dem Flügelansatz ebenso gefärbt. Oberseite der Fühler, Schienen und Tarsen schwarz.

Abessinien (Typen); 2 ♀; Luluaburg, Kongo (8. V. 14, 1 ♀ Callewaert leg.) (Mus. Kongo; Franz. Kongo, Fort Crampel, 1 ♀.

♂. Synagriforme, capite et thorace brevissime fusco-tomentosum. Ochracei sunt: Labrum, mandibulae, clypeus et glabella; laete aurantiaci sunt: antennae omnino, linea angusta orbitae

internae a clypeo usque in fundum sinus, linea abbreviata orbitae posticae, tibiae, tarsi antici et segmenta abdominalia 4.—7. Alae valde obscuratae, violaceo-micantes. Long. corp. (usque ad marg. post. terg. 2.) 12 mm.

Pretoria, 15. XI. 23, 1 ♂.

Kopf sehr zerstreut und seicht punktiert; Zwischenraum zwischen den Punkten, die um ein mehrfaches größer sind als die Punkte selbst, mikroskopisch fein und dicht chagriniert. Scheitelmittle fast punktlos. Oberlippe schmal und lang, gerade abgestutzt. Oberkiefer lang, mit scharfem, gebogenem, spitzem Endzahn; Innenrand ohne Zähne, nur mit einigen Einkerbungen. Fühlerglied 3 $1\frac{1}{2}$ mal so lang als das 4., fast 3mal so lang als an der Basis breit. Fühlerhaken lang, konisch, gebogen, in scharfer Spitze endigend, die Basis des 10. Gliedes erreichend. (Fig. 10.) Kopfschild äußerst fein punktiert, matt, mit sehr zerstreuten groben Punkten, ebenso lang als breit; Unterrand breit, leicht ausgerandet, etwa so lang wie das 3. plus halbe 4. Geißelglied. (Fig. 9b.) Zwischenräume zwischen den Fühlern mit starkem Kiel. Nebenaugen in sehr flachem Bogen; Entfernung der hinteren Nebenaugen vom Netzauge kleiner als diejenige der hinteren Nebenaugen voneinander. Hinter den Nebenaugen eine quer verlaufende, bogenförmige Grube. Schläfen scharf gerandet, punktiert wie die Stirn; ihre Breite auf Niveau der Augenausrandung gleich der Länge von Geißelglied 2. Thorax sehr dicht und grob runzlig punktiert. Pronotum vorn mit scharfem, leicht aufgeworfenem Rand; Seitenecke rechtwinklig; Flügelschuppen matt, sehr fein punktiert mit ganz vereinzelt gröberen Punkten. Schildchen flach, wie das Dorsulum punktiert, nur noch etwas gröber. Hinterschildchen quer, über das Niveau des Schildchens emporragend, mit scharfer, fein gezählter Kante, mitten mit tiefem Eindruck, so daß zwei runde Buckel entstehen; hinter der Kante senkrecht abfallend; seine Hinterfläche matt, fein skulpturiert. Mittelsegmenthinterfläche mäßig vertieft; obere Kante abgerundet; untere scharf, aber nicht vorspringend; Seitenecken einen breiten, stumpfen Zahn bildend. Obere Partie des Mittelsegmentes wie das Schildchen runzlig punktiert. Außenkante scharf. Mesopleuren wie das Dorsulum runzlig punktiert. Metapleuren nur dem Vorderrande entlang mit groben Punkten bedeckt, sonst sehr fein nadelrissig. Seiten des Mittelsegmentes in der oberen Partie mit groben Punkten nach unten mit mäßig groben Längsrünzeln versehen, deren Zwischenräume fein chagriniert sind. Flügel stark verdunkelt, violett schimmernd. 3. Cubitalzelle viel höher als breit; 3. Cubitalader stark S-förmig gebogen. Radialsektor der 2. Cubitalzelle halb so lang wie derjenige der 3.;

letzterer ebenso lang wie der Sektor der Cubitalader vom Eintritt der 3. Cubitalader bis zum Ende der Radialzelle. Beine nichts Besonderes. Hinterhüften nach hinten außen mit starkem, flachem Zahn. Abdomen schwarz tomentiert; die Seiten der Tergite zerstreut punktiert; Hinterrand des 2. Tergits leicht aufgeworfen. 2. Sternit zerstreut punktiert mit breiter, flacher, gegen die Seiten ziemlich scharf begrenzter medianer Grube.

Der Guérinsche Typus zeigt gegenüber meinem Exemplar einige Verschiedenheiten, nämlich: Scheitel etwas dichter punktiert, immerhin Zwischenräume zwischen den Punkten größer als diese selbst, Kopfschildunterrand ganz gerade abgestutzt, nicht ausgerandet und Färbung von Kopfschild, Fühler, Glabella und innerem Augensaum dunkelrot und nicht gelb.

23b. *Rh. ardens* Guérin subsp. *junodi* Gribodo.

Rh. junodi Gribodo, Bequ. l. c. p. 302, no. 94.

Rh. lacuum Stadelmann, Bequ. l. c. p. 303, no. 103.

Stimmt in allen plastischen Merkmalen mit *ardens* überein, auch in der Form der Genitalanhänge, so daß es füglich als Subspecies oder Varietät angesprochen werden darf.

Häufiger als die Stammform: Transvaal, Delagoa, Shilouvane, N.-O.-Rhodesia, Kalungwisi, Kasamadistrikt bis 4200 Fuß.

IV. *Odynerus* Latr.

24. *O. carinulatus* Sauss.

Bequ. l. c. p. 294, no. 35.

Als synonym betrachte ich *Rh. rubens* Sauss., Bequ. l. c. p. 309, no. 152, welcher Name dann allerdings die Priorität hätte. Auch *Rh. ruftventre* Rad., Bequ. l. c. p. 309, no. 154, gehört wohl hierher.

Häufig in Ost- und Westafrika von Abessinien bis Transvaal.

25. *O. ventralis* Sauss.

S. tropidia Schlett., Bequ. l. c. p. 314, no. 189.

Die ♀ sind von *anceps* schwer zu unterscheiden. Einzig der schärfere Rand der Grube des 2. Sternits scheint neben der Größe des Tieres ein Anhaltspunkt zu sein. Die übrigen, von Bequaert angegebenen Merkmale sind nicht konstant. Die ♂ lassen sich schwer an der Bildung des Fühlerhakens, der Mittelschenkel und der Genitalanhänge erkennen. (Fig. 11, 12, 13, 14, 15.)

Es liegen vor 8 ♂, 12 ♀ aus Ost- und Westafrika, Erythräa, Uganda, Senegal, Togo, Kamerun, Spanisch Guinea, Franz. Kongo.

26. *O. magretti* Gribodo.

Bequ. l. c. p. 304, no. 109.

Rh. forticulum Kohl, Bequ. l. c. p. 299, no. 69. (Type gesehen.)

Rh. sirdari Morice, Bequ. l. c. p. 311, no. 172.



Fig. 11.
O. ventralis Sauss.
Kopschild ♀.



Fig. 12.
O. ventralis Sauss.
Fühlerende ♂.

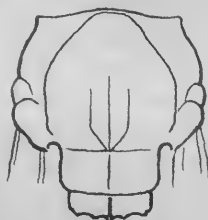


Fig. 13.
O. ventralis Sauss.
Thorax von oben.



Fig. 14. *O. ventralis* Sauss.
Mittelschenkel ♂ von vorn.
Größte Breite nahe der Mitte.



Fig. 16. *O. magretti* Grib.
Kopschild ♀.



Fig. 17. *O. magretti* Grib.
Fühlerende ♂.



Fig. 15.
O. ventralis Sauss.
Genitalanhänge ♂.

Ausgezeichnet durch den kreissektorartig ausgeschnittenen Kopschildunterrand von ♂ und ♀ (Fig. 16, 17), die helle Färbung von Kopschild, Glabella, innerer Orbita, Unterseite von Fühler-
schaft und Fühlergeißel. Auch die Beine sind heller gefärbt als bei den vorigen Arten. Segment 1 und 2 schwarz. Rest des Abdomens orangerot.

3 ♂, 1 ♀ Ostafrika, Erythräa, Sabderta, Somaliland, Horo Bussan, Umfundu (1 ♀ aus Coll. Magretti).

27. *O. anceps* Gribodo.

- a) Schwarz; 2—2 $\frac{1}{2}$ Basaltergite schwarz; übrige Tergite rot.
subsp. *anceps* Grib.

8 ♂, 4 ♀ Westafrika, Span. Guinea, Uelleburg, Kamerun, Gabun.

- b) Schwarz; Gesicht, Schläfen, Pronotum und Beine mehr weniger rotbraun. Tergit 3—5, hie und da 2—5 (3 ♂) mit elfenbeinweißer Endbinde. subsp. *albofasciatus* nov. subsp.

13 ♂, 13 ♀ Ostafrika, Kigonsera, Lukuledi, N.-O.-Rhodesia (c. m., Mus. Berlin, Mus. Oxford).



Fig. 18. *O. anceps* Grib.
Fühlerende ♂.



Fig. 19. *O. anceps* Grib.
Mittelschenkel ♂.
Größte Breite nahe der Basis.



Fig. 20.
O. anceps Grib.
Genitalanhänge ♂.

Rh. bequaerti Schout., Rev. zool. afr. 1919, VI, p. 139 (ohne Beschreibung).

Var.: Nur Tergit 4 mit schmaler, seitlich abgekürzter, weißer Binde. 1 ♀ Bangweolosee.

- c) Gesicht, Schläfen, Vorderrand des Pronotums und Beine mehr weniger rotbraun, sonst ganz schwarz.

subsp. *totoniger* nov. subsp.

2 ♂, 3 ♀ Ostafrika, S.-O.-Tanganyika, Bukabasee (c. m., Mus. Berlin). (Fig. 18, 19, 20.)

28. *O. schubotzianus* Schulth.

Rh. schubotzianum Schulth., Conf. Bequ. l. c. p. 310, no. 158.

Ist nicht als *Rhynchium*, sondern als *Odynerus* anzusehen, da die Kiefertasterglieder sukzessive an Größe abnehmen und die drei letzten zusammengenommen weit länger sind als das 3.

1 ♂ aus Span. Guinea, Hinterland von Makomo (Mus. Berlin).

29. *O. natalensis* Saussure.

Bequ. l. c. p. 306, no. 128.

Ist ausgezeichnet durch die meist ganz. hier und da nur auf der Unterseite hellrot gefärbten Fühler, den am Unterrande gerade abgestutzten, stark gewölbten, beim ♂ queren, Beckigen, hellgelb gefärbten Kopfschild und das das Mittelsegment überdachende, oben in zwei Höcker aufragende Hinterschildchen. Die Mittelsegmentseiten tragen am Zusammenstoßen der Kanten einen bis mehrere scharfe Zähne. Hinterschildchenbildung ist ähnlich wie bei *Rh. ardens*; hier ist aber die Form des Kopfschildes und der männlichen Genitalien eine andere, der vordere Augensaum ist nicht schwarz, sondern ebenfalls gelb und die Mittelsegmentecken sind nicht mehrfach gezähnt. (Fig. 21.)



Fig. 21.
O. natalensis Sauss.
Genitalanhänge ♂.

Die Ausbreitung der roten, vielmehr rotgelben Farbe am Abdomen ist großen Schwankungen unterworfen:

Stammform: Schwarz, Segment 3—6, beim ♂ 3—7 rot; 12 ♂, 7 ♀.

Var. *alpha*: Wie Stammform, 2. Tergit mit an Größe wechselnden roten Seitenflecken; 10 ♂, 5 ♀.

Var. *beta*: Segment 2—6 resp. 7 gelbrot; 1 ♂, 2 ♀.

Var. *gamma*: Segment 1 mit roten Seitenflecken, übrige Segmente rotgelb; 1 ♂.

Südostafrika, Natal, Transvaal. Alle diese Varietäten liegen vor von Lydenburg, Transvaal.

30. *O. socotrae* Kohl.

Kohl, Denkschr. math.-naturw. Klasse K. Acad. Wiss. Wien 1906, LXXI, 257.

Kohl vergleicht seinen *O. socotrae* mit *O. dantici* Rossi, dem er in der Verteilung der hellen Farbe sehr ähnlich sieht, nur daß sie statt gelb rötlich bis rot ist. Mir scheint das Tier dem *crenatus* Lep. viel näher zu stehen, mit dem es in der Form des Kopfschildes ♂ und ♀ völlig übereinstimmt. Wenn schon die für die Gruppe *simplex*, zu der *crenatus* gehört, charakteristische Bildung der Oberkante des Mittelsegmentes (aufrecht stehender, durch eine tiefe Kluft vom Hinterschildchen getrennter Zahn) bei dem mir vorliegenden ♀ nur wenig entwickelt ist, so ist sie doch (wie oft bei *crenatus*) beim ♂ sehr deutlich.

O. socotrae hat große Ähnlichkeit mit meinem *O. crenatus* var. *krügeri*; doch ist hier der Flügel von der Basis an leicht getrübt und die Adern braun, nicht wie bei *socotrae*, wo die Randader und die Flügelbasis gelb ist.

Socotra (mir liegen 2 ♂ und 1 ♀ vor, typische Stücke Kohls, aus dem Museum Wien).

31. *O. ebneri* Schulth.

O. ebneri Schulth., Acad. Anzeiger Wien 1920, no. 27.

O. meyeri Cam. var. *palaestinisensis* Schulth. 1928, Eos IV, p. 72.

Niger; aurantiaci sunt: Mandibulae pro parte, clypeus, scapus et articuli basales flagelli antennarum, macula magna triangularis inter antennis, orbita interna et externa, pronotum, tegulae, scutella, macula magna mesopleuralis, clunes segmenti mediani, pedes cum coxis et segmentum 1. abdominis. Alae quarta parte basali hyalinae, ceterum valde infumatae, violaceo-micantes; nervi fusci.

♂. Clypeus, scapus subtus, orbita interna et glabella sulfo-reae; ceterum uti in femina.

Long. corp. (usque ad marg. post. terg. 2.) ♂ 9, ♀ 10—11 mm.

Kairo, Sudan, Chartum, Palästina, Wadi el Kelt (25. IV. 27, Enslin leg.).

O. ebneri gehört zur Gruppe *simplex* und zeigt eine grob gezähnelte Hinterschildchenkante. Der Kopfschild ist nur wenig länger als breit, grob längsgerunzelt; der Unterrand ziemlich lang, so lang wie das 4. Fühlerglied, leicht bogenförmig ausgerandet; die Seiten des Kopfschildes vom unteren Ende des Auges an verlaufen gerade. (Fig. 22.) Kopf ziemlich grob und dicht punktiert. Hintere Nebenaugen etwas weniger weit voneinander entfernt als vom Netzauge. Thorax gedrun-gen, nach vorn und hinten nur wenig verschmälert, sehr dicht, mäßig grob punktiert. Flügelschuppen dem Rande entlang mit groben Punkten besetzt. Schildchen flach.



Fig. 22.
O. ebneri Schulth.
Kopfschild ♀.

Hinterschildchen scharf gekantet; Kante quer kaum gewölbt, grob unregelmäßig gezähnt. Hinterfläche des Hinterschildchens glatt und glänzend. Mittelsegmenthinterfläche stark konkav, grob diagonal gerunzelt; obere Kante scharf, nach oben in breitem, scharfem Zahn endigend; untere Kante viel weniger scharf, Seitenecke mit starkem, breitem Zahn. Flügel und Beine nichts Besonderes. Mesopleuren grob runzlig-punktiert, noch gröber als das Dorsulum. Metapleuren und Seiten des Mittel-

segmentes grob längsgerunzelt. Abdomen ziemlich dicht, mäßig grob punktiert; Zwischenräume zwischen den Punkten nur wenig größer als die Punkte selbst. Hinterrand des 2. Tergits besonders beim ♂ aufgeworfen. 2. Sternit flach, dicht punktiert, an der Basis senkrecht abfallend.

Kopfschild des ♂ etwas schmaler als derjenige des ♀; seine größte Breite weit unter der Mitte; Unterrand viel tiefer ausgerandet. Fühlerhaken kräftig, stumpf, erreicht die Basis des 10. Fühlergliedes.

Register.

<i>Abyssinicum</i> Sauss., Rh.	316	<i>magretti</i> Grib., O.	331
<i>aestuans</i> Sauss., Rh.	307	<i>mephisto</i> Grib., Rh.	307
<i>albicauda</i> Schulth., S.	316	<i>natalensis</i> Sauss., O.	333
<i>albofasciatus</i> Schulth., O.	332	<i>neavei</i> Meade Waldo, Rh.	319
<i>anceps</i> Grib., O.	332	<i>niloticum</i> Sauss., Rh.	309
<i>ardens</i> Guérin, Rh.	327	<i>osborni</i> Bequ., Rh.	321
<i>aterrima</i> Maidl, S.	317	<i>parcula</i> nov. spec., S.	317
<i>auromaculatum</i> Sauss., Rh.	309	<i>proserpina</i> Schulth., Rh.	319
<i>bequaerti</i> Schout., O.	332	<i>rubens</i> Sauss., Rh.	330
<i>bipunctata</i> Meade Waldo, M.	319	<i>rufonigrum</i> Bequ., Rh.	322
<i>carinata</i> Sauss., S.	306	<i>rufiventre</i> Rad., Rh.	330
<i>carinulatus</i> Sauss., O.	330	<i>schubotzianus</i> Schulth., O.	332
<i>crassipes</i> Kohl, S.	310	<i>sirdari</i> Morice, Rh.	331
<i>denticulatum</i> Mocs., Rh.	319	<i>socotrae</i> Kohl, O.	333
<i>ebneri</i> Schulth., O.	334	<i>sulphureomaculatum</i> n.sp., Rh.	323
<i>fallax</i> Sauss., Rh.	310	<i>sumptuosum</i> Grib., Rh.	308
<i>forticulum</i> Kohl, Rh.	331	<i>synagroides</i> Sauss., Rh.	325
<i>grayi</i> Sauss., Rh.	319	<i>tessmannianum</i> Schulth., S.	317
<i>holomelas</i> André, Rh.	317	<i>totoniger</i> Schulth., O.	332
<i>hoplopoides</i> Schulth., S.	317	<i>tropidium</i> Schlett., Rh.	330
<i>incensum</i> Grib., Rh.	327	<i>usambaraense</i> Cam., Rh.	319
<i>junodi</i> Grib., Rh.	330	<i>ventralis</i> Sauss., O.	330
<i>junodiana</i> Schulth., S.	317	<i>versicolor</i> Schulth., S.	306
<i>lacuum</i> Stadelm., Rh.	330	<i>vicaria</i> Stadelm., S.	317
<i>luteopicta</i> Maidl, S.	310	<i>xanthurum</i> Sauss., Rh.	324

Speke's Tragelaph on the Sese Isles of Lake Victoria.

By G. D. HALE CARPENTER, M.B.E., D.M., B.Ch.,
F.Z.S. With an Appendix by Prof. E. B. POULTON,
D.Sc., F.R.S., F.Z.S.

(Plate I. and Map.)

The Sese Archipelago, like the rest of the Uganda coast of the great lake, was depopulated on account of the great epidemic of Sleeping Sickness in Uganda, and about 1909 the islands were reverting to the wild state.

Repopulation was commenced in 1919, so that for nearly twenty years the "Situtunga" flourished uncontrolled by hunters. Mr. W. F. Fiske, when employed some years ago as Medical Entomologist, told me of the interesting effect upon the flora of the islands on which the buck had especially thriven, and on a recent tour among the islands in March and April of this year I was able to see for myself something of what had occurred.

Reference to the tracing of the official chart of Lake Victoria (see p. 1426) will show the positions of the islands mentioned. The west coast of the lake does not come into the tracing south of 0°30 S., but it gradually recedes to the west, the point south of Bukakata being nearest to Sese.

The island Jana, at the north-east corner of the group, lies in a very open channel between the main group of Sese and the Damba-Kome group farther to the north-east, the nearest of which lies nine miles due north of Jana and is separated by rough water exposed to the prevailing south-easterly storms. Damba is one of the favourite haunts of Situtunga, being flat and practically covered with forest, and during my residence there in 1911 I saw and heard many buck.

I have not, however, been able to revisit the island, and am unable to speak from personal experience, though I am assured by those who have been there that similar changes have been wrought to those about to be described.

In 1912 and the first three months of 1913 I lived on the north-east corner of Bugalla, investigating the bionomics of *Glossina palpalis*. Situtunga abounded, and I frequently saw them and heard their muffled baw.

So far as the islands are concerned this buck is no longer confined to papyrus swamps; indeed, there are no papyrus swamps except on the west side of Bugalla and south side of the neck between Bugalla and Buninga.

The buck had therefore, in 1912, become in habits practically a Bush-buck. It would spend the days in the heavy forests

bordering the lake, and would be seen in the evenings feeding along the edges of the forest abutting on the open grassland: especially favoured bushes were the Euphorbiaceous *Alechornea chordata* with leaves like poplar. A view of a typical evening feeding-ground is given in 'A Naturalist on Lake Victoria,' p. 142. The character of the undergrowth in the forests in those days is shown in the same book, p. 78. It was mainly composed of two or three species of Anonaceae, whose glossy, smooth, green leaves reached knee-high, or sometimes waist-high.

I made large collections of butterflies with a view to studying the mimetic relationships of the forms of the Nymphaline *Pseudocrea eurytus* and its Acraeine models and associates of genera *Planema* and *Acraea* (see Trans. Ent. Soc. March 1914, pp. 606-645). These butterflies flitted through the forests and in open sunlit spaces, settled on the leaves of the undergrowth, and in the evenings were also taken on flowering *Haronga* (Gamboge) bushes at the edge of the forest.

Glossina palpalis was also abundant, and a typical "fly beach" was visited daily. (For illustrations of this and other scenery on Bugalla consult 'A Naturalist on Lake Victoria.') As many as seventy *palpalis* could then be caught by a fly-boy in a hour.

I left Bugalla in March 1913 and did not see it again until after the war. During the war Major Meinertzhagen visited it and also Nkosi Isle at the extreme south of Sese, and reported on the Situtunga in an interesting paper (P. Z. S. June 1916, pp. 375-381), wherein he showed that both horns and feet of the island buck differed considerably from those of the mainland types and were returning to the Bush-buck type, while those on Nkosi showed such a degree of deviation that the animals are given subspecific rank. It is not surprising that habits of a Bush-buck, away from swamps, should lead to a return towards the less specialized form of hoof from which presumably the ancestral Tragelaphs diverged as they were more and more adapted to live in swamps and became the typical Situtunga of to-day.

I had visited Nkosi just before leaving Sese in 1913, and had noted the dense character of the undergrowth, but, being only there for a brief rest during a long canoe-voyage, had not explored the island. At two points on the coast little grassy dells were noticed, evidently much frequented by the buck and closely grazed. During the war Mr. W. F. Fiske visited Nkosi, and he told me that the buck were so plentiful that they had made regular lanes through the undergrowth and bush.

Mr. Fiske reported fully (in the 'Bulletin of Entomological Research,' vol. x. part 4, May 1920) on the intimate relation between *Glossina palpalis* and Situtunga. The distribution of these buck through Sese is somewhat peculiar and difficult to understand. On my recent tour I endeavoured to obtain as much information from the natives as I could.

The buck have never been known on Bubeke or Bukassa on

the east of Sese, nor do they seem to have found their way there during the period when the islands were uninhabited.

There seem to be none on Bunjazi, Buyovu, or Mbugwe, though there is no apparent reason why they should not be there. They are occasionally found on Bufumira, where I saw one old foot-print. Bugaba is doubtful. On Bubembe they are extremely plentiful, and fly (*G. palpalis*) accompanies them all over the central jungle of the island to the extent of a catch of eighty males per boy per hour! Fumve and its neighbouring islets Bwiggi and Mgabu have plenty of Situtunga.

Very curiously, the three associated isles (Kuye, Buguye, and Kirugu) have none. Nkosi, however, lying nearly three miles south of these, with only a large rock (Lukinsa) between, has the animals in abundance, and they are said to visit Lukinsa. I am, unfortunately, not able to say whether the small islets of the Buturume group shelter the animals or not; but, even supposing they do, there is a gap of eight or nine miles between the outlying rock Lukinsa and the nearest of the Buturume group. Thus the Nkosi animals are extremely isolated.

I revisited my old haunts in the N.E. corner of Bugalla in March this year, and the difference in them is amazing. The buck have destroyed the Anonaceous undergrowth so completely that one can scarcely find a specimen. The ground in the forest is bare of vegetation save for one plant which the buck seem to dislike, and which bids fair in time to multiply so as to replace the old type of undergrowth. One walks on dead leaves and fallen sticks, and can clearly see in any direction, the view being only blocked by stems of trees and lianas (see two photographs reproduced on Pl. I.). The destruction of undergrowth seems to have had a profound effect on insect life. The *Planema-Pseudacraa* association could not be studied there now, for not a specimen was seen. (I may say that in 1922 I paid a flying visit to the old fly-beach and the forest behind, and noticed then the absence of butterflies.) The Tse-tse, *Glossina palpalis*, has apparently also felt this destruction of undergrowth, and conditions seem no longer suitable. It is with difficulty that one can be found now on the fly-beach where, in March 1912, the average for the month was thirty-six per boy per hour. On March 25th of this year fly-boys only got ten per boy per hour.

On other islands varying degrees of change are seen—and even on different parts of Bugalla—according to the numbers of the buck. Fumve shows very well the same phenomena as are described above.

On April 1st of this year I visited Nkosi Isle, in company with Mr. C. B. Symes, Medical Entomologist of Kenya Colony, who had come to Sese to see how Sleeping-Sickness affairs were being administered, and several officials of Uganda anxious to see the Situtunga. The island proved to be of intense interest.

It is no longer possible to speak of "lanes" through the bush. There is practically no undergrowth at all; crystalline rocks, of

Very remarkable is the fact, which was confirmed by all members of the party as soon as I mentioned my own experience, that the buck appear to have lost entirely their barking alarm-call. From the time the party landed, about 1 p.m., till we left at 4 p.m., before, after, and during the shooting of two animals, not a sound was heard. I am thoroughly familiar with the bark of Situtunga, and was much surprised to hear nothing of it. The island being of such small size (see map), and it being so easy for the animals to find each other, the use of the voice has apparently been lost.

As soon as a buck had been secured on one end of the island, and the party moved away to the other, Mr. Symes and I for about two hours devoted ourselves to the fauna of the island and collected what we could. The specimens have been sent to Prof. E. B. Poulton, F.R.S., of Oxford, for identification, as it seemed possible that they might be insular varieties. The most arresting phenomenon was the extraordinary abundance of ants. It was indeed painful if one brushed against any bit of a tree or bush, for one was immediately attacked and fiercely stung by a small, thin, long-legged, very active species commonly known to the Baganda as "Bursaji-saji." Normally one finds this species on leaves of trees, between which it makes its nest of curious friable brown material which fastens two or more leaves together; but it has never in my experience been seen anywhere to equal the myriads of Nkosi. Not only were they on all trees, but all over the ground.

The "Safari ant" (*Dorylus*) was also abundant on the ground, and both of us thought that the very large workers were present in much greater proportion than was usual. Other species were also taken. Other Hymenoptera were represented abundantly by large black Scoliidæ, which were observed flying about the numerous rotting fallen tree-trunks, and perhaps were preying upon the Passalid beetles therein. Mr. Symes saw a Sphegid carrying an Orthopterous victim. No Belonogaster wasps or Xylocopid bees were observed.

Perhaps most noticeable after Hymenoptera were crickets, which seemed astonishingly plentiful among the debris on the ground. Presumably they can escape the ants by leaping.

A very few young Mantidæ were seen.

Coleoptera were well represented under loose bark, but unfortunately most of the small Scolytids, together with a weevil and an earwig, were swept away by an unexpected gust of wind when being packed up.

One rotting log yielded numbers of a Passalid beetle, with its larvæ and pupæ. A medium-sized Brenthid was remarkable for being densely infested with small mites.

Tenebrionidæ occurred under bark, and some nice-looking Staphylinidæ under a rotting tree-trunk.

Lepidoptera were represented by a few moths and a single *Terias*, which was the only butterfly seen, and appeared to me

unusually large. Two Tse-tse flies (*palpalis*) were secured, both males, and two species of Coccidæ.

Besides these insects, Millipedes were noticed, and a Centipede of the Geophilid type, which, with a woodlouse, was preserved.

Two small species of snails were taken under bark.

The big *Nephila* spiders were fairly plentiful, but not to the degree that has been recorded elsewhere in Sese.

It seems pretty obvious that the great numbers of ants must find their food chiefly in the clouds of Chironomidæ or "Lake-fly," known to the Baganda as "E'sami," which drift on to the island from the open lake.

As regards Vertebrates, no other mammal but the Situtunga was noticed. The animal that was examined was free from lice or ticks of any sort. The only lizard seen on the island was the *Varanus*, common everywhere on the lake shore.

Of birds, I noticed *Halcyon senegalensis*, which presumably feeds on the numerous crickets rather than the large Acridiidae to which it is accustomed, for these cannot be abundant on Nkosi, where conditions are very unsuited to them: none were seen.

A species of *Cossypha* and *Terpsiphone* (or *Tchitrea*) were heard but not seen.

I greatly hope that at some future date I may have an opportunity of supplementing these notes and the hastily made collection. The island offers great opportunities for a most interesting investigation.

The Game Warden has been approached on the subject of Nkosi Island and has promised that its Situtunga will be placed on the list of completely protected animals as soon as the new Game Ordinance has been framed and become law.

A most interesting development is taking place on the island, and if the animals do not die out altogether from in-breeding and starvation, the stress of conditions must surely exercise a profound selective action, and who can say into what form the already aberrant Situtunga may develop? Science has here a wonderful chance of watching the production of a new species.

APPENDIX.

By Professor EDWARD B. POULTON, D.Sc., F.R.S.

Before giving an account of the collection made on Nkosi I. by Dr. Carpenter and Mr. Symes, I propose to make a few remarks on the recent changes observed in Speke's Tragelaph. It is clear that these cannot be due to the direct action of natural selection. The time is far too short, and during this time land enemies have been absent. Major R. Meinertzhagen, in the paper referred to by Dr. Carpenter, spoke of the extreme tameness of the Tragelaph on Nkosi—"sitting by a game-path I actually stroked several beasts as they walked slowly past me."

If, then, the changes are not due to direct selection, there remains the influence of changed conditions acting as a stimulus upon the young and growing organism. I suggest that the definite effects observed, especially in the hoofs, viz. the change from a marsh-buck towards a bush-buck type, are the result of an individual susceptibility to stimulus developed gradually by natural selection in a species which, for untold ages, has been led to seek first the one station and then again the other—now in the bush during periods of safety, now in the marsh when danger became too great. And the main danger has probably always been man as a hunter, the danger which for about twenty years was eliminated from the Sese Islands.

Looking at the following list of species collected by the two naturalists there does not appear to be any obvious instance of the effects of isolation, except perhaps in the land-snail *Pseudoglessola* sp., and, it may be, in some of the forms which have not yet been determined. The immense predominance of the ants is the most striking fact, together with its result—the survival of other insects with habits which protect from the attacks of ants. The fierce little ant “Bursaji-saji” is probably the Myrmicine *Macromischoides aculeatus*.

ORTHOPTERA.

BLATTIDÆ.—*Blatta agaboides* Gerst. (*Periplaneta assiniensis* Bol.)—1 ♀.

GRYLLIDÆ.—*Gryllus* sp.—1 ♂, 1 ♀.

HYMENOPTERA: FORMICIDÆ.

I. PONERINÆ.—*Pachycondyla* (*Bothroponera*) sp. ? *soror* Em.—5 ♂.

” ” sp.—2 ♂.

Plectroctena latinodis Sants.—1 ♀ (determined from description).

II. DORYLINÆ.—*Dorylus* (*Anomma*) *nigricans* Ill., var. *molesta* Gerst.—21 ♂, viz. 7 large ♂ maj., 3 very small ♂ min. and 11 transitional, of which 8 are much nearer to the 7 largest ants.

III. MYRMICINÆ.—*Macromischoides aculeatus* Mayr.—8 ♂.

Myrmecaria opaciventris Em. ? var. *crucheti* Sants.—

12 ♂ varying in size but not very greatly.*

Sima mocquerysi Aud.—1 ♂.

Tetramorium sp.—1 ♂, 16 ♀ varying but little in size.

COLEOPTERA.

PASSALIDÆ.—*Dilymus curvilineatus* Arrow—4. Also larvæ, pupa, and freshly emerged imago in spirit.

MELOLONTHIDÆ.—*Trochalus gibbosus* F.—1.

STAPHYLINIDÆ.—*Osorius assiniensis* Fauvel—7. One attacked by ♂ maj. of *Dorylus*.

COLYDIDÆ.—Gen. et sp. indet.—1.

* Fifteen larvæ or pupæ in their cocoons probably belong to this species.

LYCIDÆ.—*Metriorrhynchus* ? sp.—1.

TENEBRIONIDÆ.—*Alphitobius parallelus* Thoms.—1.

Derosphæus sanguineus Fairm.—2.

Hypophæus sp. ? *constrictus* Geb.—2.

Hypophæus sp.—1.

Paramarygmus simplex Geb., var.—1.

Selinus sp.—1 ♀.

BRENTIIDÆ.—*Neocephalus picipes* Oliv.—1.

DIPTERA.

MUSCIDÆ.—*Glossina palpalis* Rob.-Des.—1 ♂.

CULICIDÆ.—*Chaoborus pallidipes* Theo.—1 ♀.

HEMIPTERA.

PENTATOMIDÆ.—*Cryptacrus comes* F., var. *princeps* Horv.—2.

The Arachnida include one spider, *Nephila pilipes* Luc., three Chelifers of two species, and the travelling nymphs of a mite (Uropoda: Gamassidæ), crowded upon the Brentiid beetle.

A single Centipede, Millipede, and Isopod Crustacean are also present.

The Land-shells include two examples of *Trochozonites wilsoniæ* Morelet, and two of a species of *Pseudoglossola* which Major Connolly, after comparing the specimens with the material in the Zoological Department of the British Museum, believes to be probably new, although to establish it would require a larger series.

The ants were determined, so far as has been possible in the time at his disposal, by Mr. W. C. Crawley, who hopes in the near future to study some of the forms more closely.

The Coleoptera were determined by Mr. G. J. Arrow, Mr. K. G. Blair, and Dr. G. A. K. Marshall, C.M.G., D.Sc., F.R.S., and the remaining insects, the other Arthropoda, and the Mollusca by Major E. E. Austen, D.S.O., Major Connolly, Mr. W. E. China, Mr. F. W. Edwards, Dr. R. Hanitsch, Ph.D., Mr. Stanley Hirst, and Mr. B. Uvarov.

The determination of all the species except the ants and the Blattid were made in the Zoological Department of the British Museum.



SPEKE'S TRAGELAPH ON NKOSI I. (SESE ISLES).
N.W. LAKE VICTORIA.

The Blattidæ of Rodriguez.

By R. HANITSCH, Ph.D.

THE island of Rodriguez, the Blattid fauna of which I propose to describe in the following pages, forms the S.E. corner of the Malagasy sub-region. Through Saussure and Zehntner's *

* A. Grandidier, 'Histoire physique, naturelle et politique de Madagascar,' vol. xxiii., "Histoire naturelle des Orthoptères, 1ère partie, Blattides et Mantides," par MM. H. de Saussure et Zehntner (Paris, 1895)

"Orthoptera" in Grandidier's work on Madagascar, and through Bolivar's* "Orthoptera Dictyoptera (BLATTIDÆ and MANTIDÆ) of the Seychelles and adjacent Islands," the result of the Percy Sladen Trust Expedition in 1905 and 1908-9, we are already well informed of the Blattid fauna of this sub-region. Bolivar's paper covers, besides the Seychelles, practically all the islands to the S.W. as far as, but omitting, Comoro, to the S. as far as Cargados, and on the E. even includes the Chagos Archipelago, though the last-named lies outside the strict limits of this sub-region. Of Réunion and Mauritius we have only stray records of Cockroaches, viz., *Temnopteryx abbreviata*, Sauss., from Réunion (Mém. Soc. Genève, xvii. p. 149, pl. i. fig. 13 (1864)), and of Mauritius *Chorisoblatta liturifera*, Stål, *Lupparia insularis*, Sauss., *Supella supellectilium*, Serv., *Nauphæta cinerea*, Oliv., *Holocompsa cyanea*, Burm., and *H. nitidula*, Fabr. Of these only *Chorisoblatta liturifera* and *Lupparia insularis* can be regarded as indigenous to that island, as the two species of *Holocompsa* are New World forms and were, no doubt, accidentally introduced into Mauritius, whilst *Supella supellectilium* and *Nauphæta cinerea* are practically cosmopolitan.

The only published list of the Blattidæ of Rodriguez is that by Butler †, from material collected during the Transit of Venus Expedition, 1874-1875, in which he enumerates the following species:—

- Panchlora corticum*, Serville.
- Phyllodromia germanica*, L.
- Periplaneta americana*, L.
- Periplaneta rhombifolia*, Stoll.
- Polyzosteria latipes*, Walker.

The collection is preserved in the British Museum, where Dr. Uvarov has succeeded in tracing it, with the exception of *P. americana*. An examination of the collection by him and by myself shows that *Periplaneta rhombifolia* is, of course, *Stylopyga rhombifolia*, Stoll, and that both *Panchlora corticum* and *Polyzosteria latipes* are nothing but the cosmopolitan *Pycnoscelus (Leucophæa) surinamensis*, L. The

* Ign. Bolivar, "Orthoptera Dictyoptera (Blattidæ and Mantidæ), and Supplement to Gryllidæ of the Seychelles and adjacent Islands," Ann. & Mag. Nat. Hist. (9) vol. xiii. pp. 313-359 (1924).

† A. G. Butler, "Orthoptera and Hemiptera," in "An Account of the Petrological, Botanical, and Zoological Collections made in Kerguelen's Land and Rodriguez during the Transit of Venus Expedition, 1874-1875," Philos. Trans. Roy. Soc. vol. 168 (extra vol.), p. 545 (1879).

remaining one species, represented by a single example, has nothing to do with *Phyllodromia germanica*, L., and is described below under the name of *Margattea* (?) *gulliveri*, sp. n.

Butler's meagre list can now be supplemented (i.) by a few specimens collected by Messrs. H. P. Thomasset and H. J. Snell, August to November, 1918, besides *Periplaneta americana* and *Pycnoscelus surinamensis*, including three species of *Theganopteryx* (subfam. ECTOBINÆ), each represented by a single example only, and (ii.) by two species of *Margattea* (subfam. PHYLLODROMIINÆ), each also represented by one example only—old material from the University Museum of Zoology, Cambridge, labelled "Rodriguez, F. Sinclair," concerning which no other particulars are obtainable. I am indebted to Dr. Hugh Scott for submitting to me all this material.

The fact that the collection contains three species of *Theganopteryx* is very interesting. From Madagascar eight species* of this genus are known, and from the Seychelles six, but not a single one has been recorded from any of the intervening islands visited by the Percy Sladen Trust Expedition, viz. Coetivy, the Amirantes, Cosmoledo, Astove, Farquhar, Aldabra, Assumption, the Chagos Group, and Cargados. All these islands are small and low coralline atolls, differing greatly from the Seychelles and Rodriguez. Most of the material of *Theganopteryx* from the Seychelles is expressly recorded by Bolivar (from Scott's field-notes) as having been taken in high damp forest, at altitudes of 1000 to 2000 ft. Only one or two stray examples were taken in the drier, less endemic type of forest near the sea-level on Félicité Island. The island of Rodriguez, too, though only about 42 square miles in extent, rises to a comparatively considerable height, viz. 1300 ft., and was at one time clothed with virgin forest. Whilst it is thus explicable enough that *Theganopteryx* occurs in the Seychelles and on Rodriguez, and also in Madagascar—though in each case represented by different species,—but is absent from all the intervening coralline atolls, it is noteworthy that it has not yet been recorded from Réunion and Mauritius. Curiously enough, this agrees with the distribution of another group of insects on these islands. Hugh Scott, in his "Introductory Note" to F. W. Edwards's paper on the "Diptera Nematocera from Rodriguez Island" (Ann. & Mag. Nat. Hist.

* *T. conspersa*, S., *T. difficilis*, S., *T. punctata*, S., *T. bidentata*, S. and Z., *T. hova*, S. and Z., *T. malagassa*, S. and Z., *T. molesta*, S. and Z., and *T. tricolor*, S. and Z.; whilst *T. punctulata*, S. and Z., and *T. veltzkowiana*, S. and Z., seem to belong to the PHYLLODROMIINÆ.

(9) xii. p. 330 (1923)), says: "Nearly all of the Rodriguez genera [of Diptera Nematoeera] are represented in the Seychelles, but by different species: e. g., *Simulium* has a single species in Rodriguez and a single, quite distinct, representative in the Seychelles; *Probezzia* is represented in the Seychelles by four species, and in the Rodriguez collection by one species, quite distinct from any of those four." And again: "One would naturally seek for affinities with the fauna of Rodriguez in Mauritius and Réunion, which lie between 350 and 500 miles to the west, but I am not aware that any data are forthcoming with regard to the Nematocera of the last-named islands."

The distribution of the genus *Margattea* is also interesting and recalls, at least in some respects, that of *Theganopteryx*. Bolivar describes three species of *Margattea* from the Seychelles, viz., *M. crassivenosa*, *M. parvula*, and *M. longicercata*. One of these, viz., *M. longicercata*, occurs also on the Amirantes, Coetivy, Farquhar, Aldabra, and Cargados, and *M. parvula* also on Farquhar and Aldabra. A further species, *M. laxiretis*, is known from the Chagos only. However, none of these forms reaches Rodriguez, and the genus is there represented by two or three other species. And, as in the case of *Theganopteryx*, no species of *Margattea* has yet been recorded from Réunion and Mauritius.

The distribution of the other species hardly calls for special remark. *Periplaneta americana*, L., *Stylopyga rhombifolia*, Stoll, and *Pycnoscelus* (*Leucophæa*) *surinamensis*, L., which were taken on Rodriguez during the Transit of Venus Expedition, and then again by Messrs. Thomasset and Snell, are cosmopolitan forms, and are known also from the Seychelles and most of the "adjacent islands," but seem, curiously enough, not to have been recorded as yet from either Réunion or Mauritius.

The TYPES of this collection will all be preserved in the British Museum (Natural History).

LIST OF THE BLATTIDÆ KNOWN FROM RODRIGUEZ.

Ectobinæ:

- Theganopteryx picturata*, sp. n.
 „ *snelli*, sp. n.
 „ *thomasseti*, sp. n.

Phyllodromiinæ:

- Margattea sinclairi*, sp. n.
 „ *bilobata*, sp. n.
 „ (?) *gulliveri*, sp. n.

Blattinæ :

Periplaneta americana, L.*Stylopyga rhombifolia*, Stoll.

Panchlorinæ :

Pycnoscelus (Leucophæa) surinamensis, L.

DESCRIPTIONS OF THE SIX NEW SPECIES.

1. *Theganopteryx picturata*, sp. n. (Fig. 1.)

♂. Head only slightly free, testaceous, a small brown spot on the vertex, a larger, broad, triangular, brown spot above the antennal sockets; three narrow broken bands, also brown, across the face; antennæ (mutilated) light testaceous; eyes apart by $\frac{1}{3}$ the width of the head. Pronotum sub-elliptical, broadest behind the middle, slightly produced behind; disk light testaceous, with intricate, slightly asymmetrical markings of brown lines and dots; lateral margins broad, hyaline. Tegmina much exceeding the abdomen, pale testaceous, veins standing out as narrow

Fig. 1.

*Theganopteryx picturata*, sp. n., ♂.Pronotum, $\times 9$.

cream-white lines, interrupted by numerous small brown spots which are more crowded towards the apex; costal area broad, 12 costals of which the tenth and eleventh are ramose; 8 oblique discoidal sectors; anal sulcus not prominent, 5 anals, each interstice with two rows of minute brown pits. Wings pale fuscous; mediastinal vein bifurcate, 10 costals, the first eight simple, their ends somewhat incrassated, the 9th and 10th ramose; median vein simple, straight; ulnar 4-ramose; apical triangle large, fuscous; first axillary 4-ramose. Abdomen below testaceous. Subgenital lamina large, hexagonal. Cerci testaceous, the terminal joints alternating testaceous and black. Styles small, cylindrical, colourless. Legs pale testaceous; front femora on the anterior margin with about 3 large spines, followed distally by a series of minute piliform spines (type B).

♂. Total length 13 mm.; body 11 mm.; pronotum 3×4 mm.; tegmina 11 mm.

Loc. Rodriguez (*Thonnasset and Snell*, viii.-xi. 1918), 1 ♂.

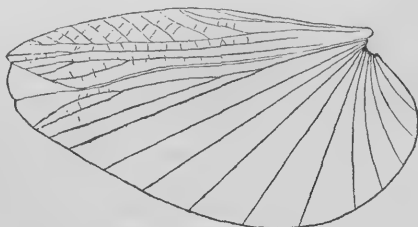
This species seems closely allied to *T. conspersa*, Saussure, from Madagascar ('*Societas Entomologica*,' vi. (1891) p. 26; and Grandidier, *Hist. nat. Madagascar*, Orthoptera, 1895, p. 10), the type of which, however, I have not been able to see. Saussure describes the disk of the pronotum of *T. conspersa* as "orné de points et de lignes en arabesques, avec deux lignes longitudinales médianes, brunes," and the tegmina as spotted, which would agree with the markings of the present species. However, the venation of the wings differs in the two cases: the ulnar of *T. conspersa* is bifurcate, but 4-ramose in *T. picturata*. Further: *T. picturata* has 10 costals, of which the first eight are simple, and the 9th and 10th ramose, whilst *T. conspersa* has 8 or 9 costals (according to Saussure's description), all simple (according to his illustration).

One interesting point has yet to be mentioned: of the eight species of *Theganopteryx*, known from Madagascar, five have spotted tegmina, viz., *T. conspersa*, S., *T. difficilis*, S., *T. punctata*, S., *T. hova*, S. and Z., and *T. molesta*, S. and Z., whilst in three species they are not spotted, viz., *T. bidentata*, S. and Z., *T. malagassa*, S. and Z., and *T. tricolor*, S. and Z. Of the six species recorded from the Seychelles none has spotted tegmina, whilst of those from Rodriguez *T. picturata* has spotted tegmina, but the two other species, described below, have not.

2. *Theganopteryx snelli*, sp. n. (Fig 2.)

♂. Head freely exposed, vertex deep orange, a dull white patch between vertex and antennal sockets, face pale orange;

Fig. 2.



Theganopteryx snelli, sp. n., ♂.

Left wing, $\times 6$.

eyes apart $\frac{1}{3}$ the width of the head; antennæ pale orange-fulvous. Pronotum broad-oval, anterior and posterior

margins almost straight; disk dull orange, its right and left halves enclosed by dark brown lines; lateral margins broad, fulvous. Tegmina exceeding body and cerci, hyaline, with a fulvous hue, except in the anal area; veins delicate, fulvous, cross-veinules well marked, producing a reticulate appearance; 11 costals; 7 somewhat oblique discoidal sectors; anal area at its proximal border with a dark brown patch, and with a few brown dots following the anal veins. Wings fuscous, costal border whitish; mediastinal vein bifurcate; radial vein simple, almost straight, 11 costals; median vein distally bifurcate; ulnar 3-ramose; apical triangle well developed, anterior half uniform smoky, posterior half with a whitish patch; first axillary 4-ramose. Abdomen above orange-testaceous, below pale testaceous. Cerci pale testaceous. Subgenital lamina large, hexagonal. Styles short, cylindrical. Legs yellowish testaceous; front femora on the anterior margin with 3 long spines, followed by a series of most minute piliform spines (type B).

♂. Total length 11 mm.; body 8 mm.; pronotum 2×3 mm.; tegmina 9 mm.

Loc. Rodriguez (*Thomasset and Snell*, viii.-xi. 1918), 1 ♂.

3. *Theganopteryx thomasseti*, sp. n.

♂. Head exposed, orange, vertex darker; eyes apart at least $\frac{1}{3}$ the width of the head; antennæ testaceous. Pronotum suboval, broader behind than in front, posterior border only very slightly produced; disk indistinctly mottled dark and light castaneous; lateral margins broadly hyaline. Tegmina exceeding the abdomen, semi-hyaline testaceous, except the anal area; 10 costals, of which the 9th and 10th are ramose; 8 strongly oblique discoidal sectors; proximal $\frac{1}{5}$ of anal area dark castaneous, the anal veins appearing as broken castaneous lines. Wings with the greater part of the costal area colourless, remainder fuscous; 9 costals, median vein simple, ulnar 3-ramose, apical triangle well marked, first axillary 4-ramose, the first two branches distally anastomosing. Abdomen below pale testaceous. Subgenital lamina large, hexagonal. Cerci pale testaceous. Styles short, cylindrical. Legs orange, anterior femora on the anterior margins with a few large spines, followed by a series of most minute piliform spines (type B).

♂. Total length 10 mm.; body 7.5 mm.; pronotum 2×3 mm.; tegmina 8 mm.

Loc. Rodriguez (*Thomasset and Snell*, viii.-xi. 1918), 1 ♂.

This species closely resembles the preceding one in general

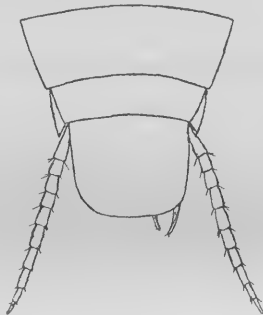
appearance and colouring, but shows certain differences in venation which may be tabulated as follows:—

<i>T. snelli.</i>	<i>T. thomasseti.</i>
Tegmina: 11 costals; 7 discoidal sectors.	Tegmina: 10 costals; 8 discoidal sectors.
Wings: 11 costals; median vein bifurcate; first axillary with the first two branches free.	Wings: 9 costals; median vein simple; first axillary with the first two branches anastomosing.

4. *Margattea sinclairi*, sp. n. (Fig. 3.)

♂. Head exposed, mottled fuscous and ferruginous; eyes apart by at least $\frac{1}{3}$ the width of the head; antennæ (mutilated) ferruginous. Pronotum with the anterior margin parabolic, posterior margin slightly produced; disk mottled dull orange and ferruginous; lateral margins broad, hyaline. Tegmina exceeding body and cerci, uniform pale amber, semi-hyaline; radial bifurcate at $\frac{3}{5}$ its length, its posterior branch ramose; 13 costals; 8 longitudinal discoidal sectors; anal area narrow, elongate, anal sulcus ending

Fig. 3.



Margattea sinclairi, sp. n., ♂.

End of abdomen from below, $\times 9$.

in the middle of the sutural margin, 6 anals. Wings pale fulvous, middle of the costal margin brownish; mediastinal vein 5-ramose; radial vein bifurcate at $\frac{3}{5}$ its length; 11 costals, the first five stout, dark brown, terminally lighter; posterior branch of radial 3-ramose; median vein simple, only slightly sinuous; ulnar 4-ramose; no apical triangle; first axillary 4-ramose. Abdomen below ferruginous-testaceous; subgenital lamina large, produced, longer than broad, apex rounded. Cerci ferruginous. Styles asymmetrical, shifted to the left, bearing a few fine hairs apically. Legs testaceous, front femora on their anterior margins with

4 stout spines, followed distally by a series of minute piliform spines (type B).

♂. Total length 16 mm.; body 13 mm.; pronotum 3×4 mm.; tegmina 12.5 mm.

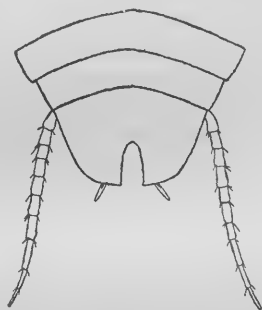
Loc. Rodriguez (*F. Sinclair*, no date), 1 ♂.

The large size of the subgenital lamina, with its asymmetrical styles, will distinguish this from allied species.

5. *Margattea bilobata**, sp. n. (Fig. 4.)

♂. Head exposed, fusco-testaceous; eyes apart $\frac{1}{3}$ the width of the head; (antennæ missing). Pronotum broad, suboval, posterior margin slightly rounded; disk mottled testaceous and fuscous; lateral margins broad, hyaline. Tegmina exceeding the body, reaching to the tip of the cerci, pale testaceous, semi-hyaline; 11 costals, the first eight simple, the ninth, tenth, and eleventh ramose; 7 longitudinal discoidal sectors; anal sulcus ending at $\frac{1}{3}$ of

Fig. 4.



Margattea bilobata, sp. n., ♂.

End of abdomen from below, $\times 9$.

the sutural margin; 5 anals. Wings hyaline, veins delicate and pale, costals with a faint fulvous tinge; mediastinal bifurcate; radial straight, simple; 5 costals, the first three of which are simple, the fourth and fifth ramose; median vein simple; ulnar 5-ramose; apical triangle only slightly developed; first axillary 4-ramose. Abdomen below rufo-testaceous; sub-genital lamina produced, with a broad median cleft, dividing the lamina down to nearly its centre into two sub-triangular lobes, to the outer margins of which the short and stout styles are attached. Cerci long, rufo-testaceous, hirsute. Legs testaceous, strongly armed; front femora on their anterior margin with 2 or 3 long spines, followed by a

* From the two lobes of the sub-genital lamina.

series of piliform spines, extending over more than half the length of the femur (type B).

♂. Total length 13.5 mm.; body 10 mm.; pronotum 2.8×4.5 mm.; tegmina 10 mm.

Loc. Rodriguez (*F. Sinclair*, no date), 1 ♂.

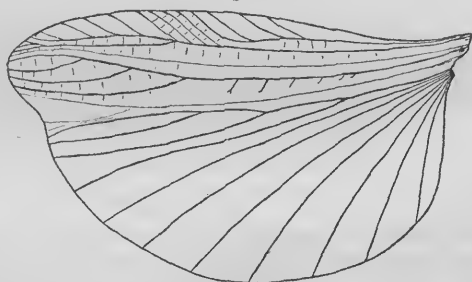
This species is closely allied to *M. longicercata*, Bolivar, from the Seychelles. It differs from it by the fissure of the subgenital lamina of the ♂ being much wider, and by the venation of the wings. The veins of *M. longicercata* are stout and fulvous in colour, those of *M. bilobata* delicate and pale. The ulnar vein of the wing of either species is 5-ramose, but whilst in *M. longicercata* the main branch gives off four branches, in *M. bilobata* the five branches are produced by repeated bifurcation.

Two other allied forms are *M. fissa*, Sauss., from Madagascar, and *M. parvula*, Bol., from the Seychelles, the differences of which from *M. longicercata* are given in Bolivar's paper.

6. *Margattea* (?) *gulliveri*, sp. n. (Figs. 5 & 6.)

♀. Head free, testaceous to light castaneous, a large darker blotch just above the antennal sockets; eyes apart $\frac{1}{3}$ the width of the head; antennæ (mutilated) castaneous, their basal joints testaceous. Pronotum large, anterior

Fig. 5.



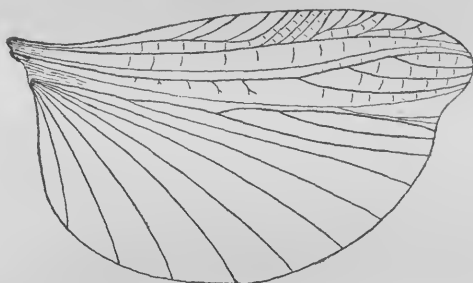
Margattea (?) *gulliveri*, sp. n., ♀.

Left wing, $\times 5$.

margin parabolic, posterior margin slightly produced; disk rufo-castaneous, with a few darker blotches; lateral margins broad, pale fulvous. Tegmina exceeding the abdomen, pale amber, unicolorous; 12 costals, the first nine simple, the 10th and 11th very long, multi-ramose, the 12th simple; 9 longitudinal discoidal sectors; anal arca long and narrow, 6 anal veins. Wings hyaline, with the anterior border and the apex fulvous; mediastinal vein very long, reaching to quite $\frac{3}{5}$ the length of the wing, 4-ramose; radial

(left) bifurcate at $\frac{3}{4}$ from its base, anterior branch with 8 simple costals, posterior branch 3-ramose; radial (right) simple, with 6 costals, the 4th and 5th of which are ramose; median vein simple, slightly sinuous; ulnar 4-ramose; 1st axillary 4-ramose; transverse venules strongly developed, some of those arising from the middle of the ulnar vein being especially long and directed forwards, reminding of *Ischnoptera*. Abdomen above and below fuscotestaceous. Supra-anal lamina transverse rhomboidal (in poor condition, shrivelled up). Sub-genital lamina rounded (cerci missing). (Legs missing, with the exception of the right mid-coxa and femur, and the right hind coxa, femur, and tibia.) Posterior femur not armed on the anterior

Fig. 6.

*Margattea* (?) *gulliveri*, sp. n., ♀.Right wing, $\times 5$.

margin, with two large spines towards the end of the posterior margin.

♀. Total length 17 mm.; body 12 mm.; pronotum 3.5×5 mm.; tegmina 14 mm.

Loc. Rodriguez (*G. Gulliver*, Transit of Venus Expedition, 1874-5), 1 ♀.

This species, which Butler recorded under the name of *Phyllodromia germanica*, L., can on account of its large size and light castaneous colour readily be distinguished from the other species of *Margattea* recorded from Rodriguez and the Seychelles. Its generic position must remain uncertain, (1) as the ♂ is unknown, (2) as both fore-legs are missing.

**Dr. E. Mjöberg's zoological collections from
Sumatra.**

11.

Blattidæ.

By

R. HANITSCH.

With 3 figures in the text.

Communicated March 13th 1929 by Y. SJÖSTEDT and E. STENSIÖ.

The Blattidæ described in the following pages were collected by Dr. E. MJÖBERG during the years 1919 to 1921, whilst in charge of the Zoological Division of Deli Experimental Station, Sumatra. All the localities mentioned are on the so-called East Coast of Sumatra, i. e. Medan & neighbourhood, with the single exception of Kota Tjane which lies further North, in Southern Acheen.

The collection comprises 55 species. Of these, 11 species are here described as new, 25 others had not been taken in Sumatra before, leaving only 19 species previously known from there. Most of the additions belong to the sub-families of Ectobinæ and Pseudomopinæ (= Phyllodromiinae).

As was to be expected, the Blattid fauna of the East Coast of Sumatra shows a close relationship to that of the Malay Peninsula. Out of this collection of 55 species not less than 33 species are known to occur on the Malay Peninsula. I just have had the opportunity of examining a collection from the West coast of Sumatra, viz. from Fort de Kock & neighbourhood, brought together by Mr. E. JACOBSON, the results of which I hope shortly to publish elsewhere. That collection consists of 56 species, & of these only 17 species are

found in Dr. MJÖBERG's collection from the East coast. This is somewhat unexpected, & it will be interesting to see when the Blattid fauna of those regions is better known, whether the East coast of Sumatra has actually a closer faunistic relationship to the Malay Peninsula than to the West coast.

I have kept synonyms & references to literature as short as possible. Full particulars will be found especially in the following of my papers:

Malayan Blattidæ. J., S. B., Royal Asiatic Soc., No. 69, pp. 17—178, 7 pls. 1915.

Malayan Blattidæ. Part. II. J., M. B., Royal Asiatic Soc., Vol. I, pp. 393—474, 2 pls. 1923.

On a Collection of Blattidæ from Northern Sarawak, chiefly Mt. Murud & Mt. Dulit. Sarawak Museum J., Vol. III, pp. 75—106, 18 figs. 1925.

On a Collection of Blattidæ from Southern Annam. J., Siam Soc., Vol. VII, pp. 7—48, 18 figs. 1927.

Spolia Mentawiensia: Blattidæ. Bulletin of the Raffles Museum, Singapore. No. 1, pp. 1—44, 2 pls. 1928.

List of Species.

[N. B. Only the species marked with an asterisk * had previously been recorded from Sumatra.]

Ectobinæ.

**Theganopteryx apicigera* WALKER.

**Hemithysocera histrio* BURMEISTER.

» *palliat* FABRICIUS.

» *ridleyi* SHELFORD.

Anaplecta malayensis SHELFORD.

» *vittata* HANITSCH.

» *fulva* BRUNNER(?).

» *sumatrensis* n. sp.

Anaplectella smedleyi HANITSCH.

» *mjöbergi* n. sp.

» *ornata* n. sp.

Anaplectoidea nitida SHELFORD.

Pseudomopinae (= Phyllodromiinae).*Ischnoptera ridleyi* SHELFORD.» *bioculata* n. sp.» *njöbergi* n. sp.» *breviramis* n. sp.» *incerta* n. sp.**Blattella germanica* L.» *tristis* HANITSCH.**Neoblattella radicifera* HANITSCH.» *larvata* n. sp.*Margattea contingens* WALKER.» *latius-vittata* BRUNNER.» *nimbata* SHELFORD.» *reticulata* FABRICIUS.» *setifera* n. sp.*Eoblatta notulata* STÅL.*Chorisoblatta diagrammatica* HANITSCH.» *picturata* SHELFORD.**Ceratinoptera klossi* HANITSCH.**Epilamprinae.****Pseudophoraspis nebulosa* BURMEISTER.**Rhabdoblatta procera* BRUNNER.**Rhcnoda rugosa* BRUNNER.**Blattinae.***Platyzosteria soror* BRUNNER.*Blatta concinna* DE HAAN.**Periplaneta americana* L.* » *australasiae* FABRICIUS.» *niveipalpis* HANITSCH.* » *robinsoni* HANITSCH.* » *truncata* KRAUSS.*Homalosilpha decorata* SERVILE.**Archiblatta havenii* VOLLENHOVEN.*Protagonista aterrima* n. sp.**Panchlorinae.****Pycnoscelus* (= *Leucophaea*) *surinamensis* L.* » » *niger* BRUNNER.**Corydinae.***Ctenoneura major* HANITSCH.*Holocompsa debilis* WALKER.

Oxyhaloinæ.*Diploptera dytiscoides* SERVILLE.*Chorisoneura lativitreæ* WALKER.» *apicalis* n. sp.*Areolaria fieberi* BRUNNER.**Perisphærinæ.***Paranaupharta javanica* SAUSSURE.* » *lyrata* BURMEISTER.**Panesthinæ.*** *Salganea morio* BURMEISTER.* *Panesthia javanica* SERVILLE.**Ectobinæ.***Theganopteryx apicigera* WALKER.

Numerous examples from Medan, Perdagangan, Bah Lias & Tjinta Radja.

Known from all parts of Malaysia.¹

Hemithyrsocera histrio BURMEISTER.

Numerous examples from Medan, & Bah Lias.

Known from all parts of Malaysia, & from Celebes.

Hemithyrsocera palliata FABRICIUS.

Numerous examples from Medan, Tjinta Radja, & Arnhemia.

Known from Ceylon, India, China, Indo-China, Lower Siam, the Malay Peninsula & Sumatra. Also taken by Dr. Mjöberg on Mt. Dulit, Sarawak. Not yet recorded from Java.

Hemithyrsocera ridleji SHELFORD.

Several examples from Medan, Arnhemia, Tjinta Radja, & Pekan Baroe (Siak).

This is the first record from Sumatra. SHELFORD's description was based upon a single ♂ from the Botanic Gardens, Singapore, which is now in the Oxford Museum, & this species had since not been taken again. Shelford correctly des-

¹ According to the now general usage Malaysia is here taken to include the Malay Peninsula, Sumatra, Borneo with Palawan, & Java with Bali.

cribed the ulnar vein of the wing in the type as simple. I find, however, that this condition is not constant. In five examples which I have examined, the ulnar vein is as follows: simple in a ♂ from Arnhemia; bifurcate in a ♂ from Pekan Baroe; simple in a ♀ from Medan; bifurcate in a ♀ from Medan; trifurcate in a ♀ from Tjinta Radja. — The front femora which are missing in the type, are in the Sumatran specimens armed after type A.

Anaplecta malayensis SHELFORD.

Several examples from Medan, Tjinta Radja, & Kota Tjane.

SHELFORD described this species first from the Malay Peninsula, & I have recorded it from Mt. Murud, Sarawak, where it had been taken by Dr. MjöBERG. This is now the first record from Sumatra.

Anaplecta vittata HANITSCH.

Several examples from Medan, Tjinta Radja, & Arnhemia.

I described this species first from Singapore, but have since seen specimens taken by Capt. H. M. PENDLEBURY at Kuala Lumpur & at Batang Padang, Perak. This is the first record from Sumatra.

Anaplecta sumatrensis n. sp.

6 examples from Medan.

♂. Head rufo-testaceous; eyes far apart; antennæ dark fuscous. Pronotum with the disk shining black, a diffused broad median streak of pale fulvo-rufous running along its entire length; lateral margins broad hyaline. Tegmina fusco-castaneous, costal margin broad hyaline; 8 costals, 3 longitudinal discoidal sectors; anal sulcus broad, whitish.

Wings faintly infuscated, costal area dark fuscous, apical area yellowish-brown, darkest along the anterior margin; 5 costals; radial vein bifurcate, the anterior branch anastomosing with the basal portions of the costals; medio-discal field with 3 transverse venules; median vein simple; ulnar vein simple; 1st. axillary 3-ramose; apical area $\frac{2}{5}$ of total wing-length, basal margin very obtusely angled, apical

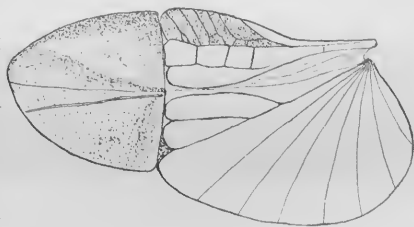


Fig 1. *Anaplecta sumatrensis* n. sp.
Left wing $\times 7$.

vein lying behind the apical fold. Body below fusco-testaceous. Cerci pale fuscous. Legs testaceous.

Total length 6 mm; tegmina 4,5 mm.

Closely allied to *A. malayensis* SHELFORD, from which it can readily be distinguished by the median rufous streak of the pronotum. Also taken by Mr. E. JACOBSON at Fort de Kock, Sumatra, 920 m, 1924—25. (Type in Mus. Stockholm.)

Anaplecta fulva BRUNNER(?).

Ann. Mus. Genova (2), Vol. XIII, p. 12 (1893).

5 examples, Medan.

The specimens before me agree with BRUNNER's not very detailed description of his *A. fulva*, from Burma & Tenasserim, except in being somewhat smaller, viz. 5 mm in total length, as against 6,2 mm (both ♂♂). On account of this uncertainty I give a more detailed description of the specimens from Medan.

♂. Head slightly exposed, dark fulvous; eyes apart one half the width of the head; antennæ testaceous. Pronotum sub-elliptical, disk dark fulvous, lateral margins broad, fulvo-hyaline. Tegmina exceeding the body, fulvous; mediastinal vein very long, ending just beyond the middle of the costal margin; 5 costals, strongly marked; radial vein simple, straight; 2 longitudinal discoidal sectors; anal area small, anal sulcus delicate, 3 anal veins, also delicate. Wings fulvous; mediastinal vein bifurcate from its base; 6 costals, the 1st & 2nd anastomosing; radial vein straight, simple; median vein simple, sinuous; 1st axillary 3-ramose; apical area fulvous, with the anterior half infuscated; apical vein with a strongly marked double outline. Abdomen above & below testaceous. Supra-anal lamina rounded. Cerci testaceous. Sub-genital lamina bi-lobed. Styles small, white. Legs fulvous.

♂. Total length 5 mm.

Anaplectella smedleyi HANITSCH.

Bulletin, Raffles Museum, Singapore, No. 1., p. 12, pl. I, fig. 2 (1928).

1 ♀ Kota Tjane.

Total length 7 mm. — The single ♀ obtained differs from the type, ♂, from Sipora, Mentawi Is, only in a few minor characters which I do not consider of specific importance. Those differences may be tabulated as follows:

♂ (Sipora)	♀ (Kota Tjane)
tegmina: fusco-castaneous;	dark amber;
» 13 costals;	12 costals;
ulnar 4-ramose;	ulnar 5-ramose;
wings: 5 costals;	6 costals;
» 4 medio-discal cross-venules;	7 medio-discal cross-venules.

♂ & ♀ agree by the anal veins of the tegmina being obsolete, though the anal sulcus is distinct.

Anaplectella mjobergi n. sp.

1 ♂ Medan.

♂. Head exposed; vertex light brown, traversed by 3 longitudinal testaceous lines; face testaceous; eyes apart by more than $\frac{1}{2}$ the width of the head; antennæ testaceous. Pronotum with the anterior & posterior borders straight; disk pale ferruginous, lateral margins broad, greyish hyaline. Tegmina exceeding the body, pale straw-coloured; 13 costals; radial vein simple; 5 oblique discoidal sectors, almost obsolete; anal sulcus sharply defined, anal veins obsolete. Wings light fuscous, costal & apical areas denser; 6 costals, radial vein simple, nearly straight; median vein sinuous, medio-discal field with 5 cross-venules; ulnar vein bifurcate; 1st axillary 4-ramose; apical area parabolic, $\frac{2}{5}$ of the total wing-length, base rather more sharply angled than in the other species of the genus. Abdomen above fuscous; below black in front, last two segments & sub-genital lamina testaceous. Cerci testaceous, tips black. Subgenital lamina large, triangular, with two very short styles situated at the apex. Legs testaceous.

♂. Total length 6 mm. (Type in Mus. Stockholm.)

Anaplectella ornata n. sp.

1 ♀ Medan.

♀. Head covered, testaceous, a pair of castaneous maculæ between the antennary sockets; eyes apart $\frac{1}{2}$ the width of the head; antennæ testaceous, darker distally. Pronotum sub-oval, posterior border almost straight; disk testaceous to dull orange, with an intricate symmetrical design of dark-castaneous lines; lateral margins broad, testaceous hyaline. Tegmina exceeding the abdomen by $\frac{1}{4}$ of their

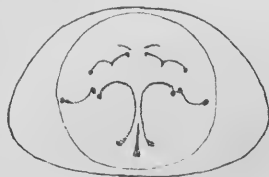


Fig. 2. *Anaplectella ornata* n. sp. Pronotum $\times 13$.

length, testaceous to amber, with a large brown blotch following the anal sulcus; 12 costals; radial vein simple; discoidal sectors aborted; anal sulcus strongly marked, anal veins aborted. Wings fuscous, costal & apical areas dense, very dark; 6 costals, their bases anastomosing; radial vein simple, nearly straight; median vein simple, sinuous; medio-discal field crossed by 5 venules; ulnar bifurcate; 1st axillary bifurcate, the anterior branch remaining simple, posterior branch 3-ramose; apical area $\frac{2}{5}$ of the total wing-length, its base obtusely angled. Abdomen above dark fuscous; below testaceous, with dark blotches. (Cerci missing.) Legs testaceous.

♀. Total length 7 mm. (Type in Mus. Stockholm.)

Anaplectoidea nitida SHELFORD.

13 examples, Medan.

Though the specimens from Sumatra are somewhat lighter in colour than the type, from Batchian, & the co-type, from Macassar, both of which are in the Oxford Museum, yet I have no hesitation of placing them under the present species. The ulnar of the wing of the type has 6 branches. SHELFORD describes this correctly, but figures 8. The Sumatran material also shows 6 branches.

This is the first record from the Malaysian sub-region, though I have also seen examples from Kuala Lumpur, taken by Capt. PENDLEBURY & Mr. E. SEIMUND.

Pseudomopinae (= *Phyllodromiinae*).

Ischnoptera ridleyi SHELFORD.

1 ♂, 1 ♀ Medan.

This is only the second record of this species, the type (♂) having been taken at Singapore. It is the largest Malaysian species of *Ischnoptera* known to me & is easily recognized by the two black longitudinal vittæ on the pronotum.

*Ischnoptera bi-oculata*¹ n. sp.

1 ♂ Medan.

♂. Head exposed, shining black; eyes large, testaceous, barely $\frac{1}{3}$ the width of the head apart (antennæ missing). Pronotum with the anterior border parabolic, posterior border slightly produced; shining black, with two large oval orange

¹ From the markings of the pronotum.

maculæ. Tegmina exceeding the body, testaceous; 18 costals; radial vein bifurcate at $\frac{2}{3}$ from its base, its two branches bifurcating twice more; 5 oblique discoidal sectors; 6 anals. Wings pale orange, costal area deeply so; mediastinal vein 4-ramose; 9 costals; radial vein simple; median vein simple, slightly sinuous; ulnar vein sinuous, sending 3 branches to the dividing vein, & 3 to the apex; apical triangle only little developed; 1st axillary 3-ramose. Abdomen above & below testaceous. Cerci fuscous. Sub-genital lamina circular. Styles small, testaceous, placed near the median line. Legs fusco-testaceous; front femora armed after type A.

♂. Total length 14 mm. (Type in Mus. Stockholm.)

The striking marking of the pronotum makes it easy to distinguish this from all other Malaysian species of the genus.

Ischnoptera mjobergi n. sp.

1 ♂, 1 ♀ Bah Lias; 1 ♂ Tjinta Radja; 2 ♀♀ Medan.

♂. Large, pale castaneous. — Head exposed, deep orange, with indistinct darker blotches on the face; eyes apart by rather more than $\frac{1}{4}$ the width of the head; antennæ fuscous-orange. Pronotum with the anterior margin parabolic, posterior margin slightly rounded; disk deep orange to ferruginous, with two large oval castaneous maculæ; lateral margins broad, fulvous. Tegmina exceeding the abdomen by $\frac{1}{6}$ of their length, uniform deep orange to ferruginous in reflected, pale amber in transmitted light; 17 costals; radial vein bifurcate from its middle, the posterior branch 3-ramose near its end; 8 longitudinal discoidal sectors; anal area elongate, anal sulcus ending at $\frac{2}{5}$ of the sutural border, 7 anals. Wings fusco-castaneous, veins strongly marked; mediastinal vein 5-ramose, extending to beyond the middle of the costal border; 10 costals; radial vein bifurcate at $\frac{2}{5}$ from its base; 11 cross-venules between mediastinal & radial; median vein simple, sinuous; ulnar vein sinuous, sending 9 short branches to the dividing vein, & 4 long branches to the apex; apical triangle only moderately developed; 1st axillary 10-ramose. Abdomen above fuscous. Supra anal lamina ferruginous, asymmetrical, right side of posterior border indented. Cerci pale testaceous, 14 joints. Abdomen below fusco-ferruginous, each segment posteriorly with a broad orange border. Sub-genital lamina sub-triangular, apex truncated. No styles. Legs dull orange. Anterior femora on the inner margin with 4 stout spines, followed by a series of about 10 smaller spines. (Type A.)

♂. Total length 19 mm; body 16 mm; pronotum 4×5 mm; tegmina 15 mm. (Type in Mus. Stockholm.)

The ♀ resembles the ♂ in all particulars, except that the orange border to the abdominal sterna is only faintly marked.

*Ischnoptera breviramis*¹ n. sp.

1 ♂, 5 ♀♀ Medan; 1 ♀ Tjinta Radja; 1 ♀ Kota Tjane.

♂. Medium size, pale orange to straw-coloured. — Head exposed, testaceous, an indistinct castaneous macula on the forehead just above the antennary sockets; eyes apart by barely $\frac{1}{3}$ the width of the head; antennæ testaceous, turning to fuscous apically. Pronotum with the anterior margin parabolic, posterior margin obtusely angled; disk faintly mottled light & dark orange; lateral margins broad hyaline, slightly orange. Tegmina exceeding the abdomen, uniformly pale amber; 15 costals, of which the 13th & 14th are bifurcate; radial vein bifurcate from its middle, the posterior branch bifurcating once more near its end; 8 longitudinal discoidal sectors; anal area elongate; 7 anals. Wings hyaline, costal area slightly fuscous; mediastinal vein extending to $\frac{1}{2}$ of the costal border, 4-ramose; 10 costals, the 8th & 9th bifurcate; radial vein bifurcate at $\frac{3}{5}$ from its base, posterior branch bifurcating again near its end; median vein simple, gently sinuous; ulnar vein sending 5 very short branches to the dividing vein, & 3 long branches to the apex; apical triangle minute; 1st axillary 4-ramose; cross-venules between the axillaries delicate, sharply defined. Abdomen above pale greyish. Supra-anal lamina large, trapezoidal, apex slightly bifid. Cerci above pale greyish, below light & dark fuscous banded. Abdomen below pale orange. Sub-genital lamina large, produced; two hook-like styles on the posterior margin, turned upwards & inwards. Legs testaceous, heavily armed; anterior femora on the inner margin with 6 stout spines, followed by about 8 smaller ones. (Type A.)

♂. Total length 14 mm; body 11,5 mm; pronotum $3 \times 3,8$ mm; tegmina 11 mm. (Type Mus. Stockholm.)

The seven ♀♀ specimens which notwithstanding their deeper colour & slightly different venation I consider to belong to the same species, differ from the single ♂ as follows: pronotum with the disk orange to light castaneous, lateral margins opaque, testaceous to orange; tegmina testaceous to dull amber; abdomen above mottled testaceous to fuscous, sides deep fuscous; abdomen below fusco-testaceous. Ulnar of the wing sending 9 short branches to the dividing vein, & 4 long branches to the apex, the short branches, however, being nearly twice as long as in the ♂.

¹ From the short branches of the ulnar vein of the wing.

♀. Total length 16 mm; body 11,5 mm; pronotum $3,2 \times 4$ mm; tegmina 11,5 mm.

This species shows a striking resemblance to *Neoblattella radicifera* mihi, from Sumatra & the Malay Peninsula (see Bulletin, Raffles Museum, No. 1, p. 20 (1928)). The transverse venules going from the ulnar to the dividing vein of the wing are in that species so strongly developed & directed apically, that it may be taken as an *Ischnoptera* in the making. In *Ischnoptera breviramis* the rami going from the ulnar to the dividing vein are extremely short, in fact not much longer than the venules of *Neoblattella radicifera*, & yet they have distinctly the character of rami. — Another point of resemblance between the two species is that the radial veins both of the tegmina & of the wings are bifurcate in either case, the posterior branch bifurcating again near its end. Two slight differences, though apparently constant, are: the root-like markings on the pronotum of *N. radicifera* are absent in *I. breviramis*, secondly, the venules between the axillaries of the wing in *N. radicifera* are of a curious washed-out appearance, whilst they are sharply defined in *I. breviramis*.

Ischnoptera incerta n. sp.

1 example (sex? abdomen missing), Medan.

Head almost hidden, deep orange; eyes black, very far apart; antennæ with the first two joints orange, remainder fuscous. Pronotum elongate, nearly as long as broad, light orange, with a few darker patches. Tegmina orange; 13 costals; radial vein bifurcate at $\frac{2}{3}$ from its base; 10 longitudinal discoidal sectors; anal area greatly elongate, anal sulcus ending at $\frac{2}{5}$ of the sutural margin, about 12 anal veins. Wings pale orange, veins only slightly deeper orange, costal area denser; 15 costals; radial vein bifurcate from its middle; median vein bifurcating near its end; ulnar vein multi-ramose, sending 4 branches to the dividing vein & 8 branches to the apex; no apical triangle; 1st axillary 5-ramose. Legs orange to ferruginous, heavily spined, anterior femora armed after type A.

Total length 15 mm; pronotum $3,8 \times 4$ mm; tegmina 13 mm. (Type Mus. Stockholm.)

The single specimen obtained shows in its pronotum a median longitudinal ridge, with irregular depressions on either side, possibly due to shrinkage. Otherwise this species exhibits great similarity to *Phyllodromia quadri-punctata* mihi, from the Malay Peninsula (J., S. B., R. Asiat. Soc., No. 69, p. 57, pl. I, fig. 1 (1915)) which I now find to be a true

Ischnoptera. It differs from that species by its pronotum & legs being practically unicolorous, but colouring & venation of tegmina & wings are almost identical in the two forms, the orange-coloured veins in both cases only faintly standing out against the similarly tinted back ground.

Blattella germanica L.

Numerous examples from Medan, Tjinta Radja, Arnhemia, & Kota Tjane.

Cosmopolitan.

Blattella tristis HANITSCH.

Bull., Raffles Museum, Singapore, No. 1, p. 16 (1928).

1 ♂ Medan.

Hitherto known from Siberut, Mentawi Is., only.

Neoblattella radicifera HANITSCH.

Bull., Raffles Museum, Singapore, No. 1, p. 20 (1928).

2 ♀♀ Medan; 1 ♀ Sibolangit.

First described by me from Padang, W. Sumatra, but apparently common in Sumatra & on the Malay Peninsula.

Neoblattella larvata n. sp.

1 ♀ Tjinta Radja.

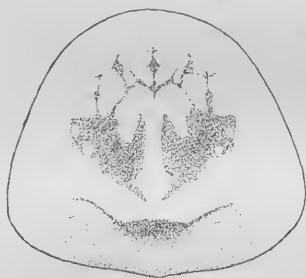


Fig. 3. *Neoblattella larvata*
n. sp. Pronotum $\times 12$.

♀. Head covered, testaceous, a castaneous blotch on the forehead above the antennary sockets; eyes apart by nearly $\frac{1}{3}$ the width of the head; antennae (mutilated) light castaneous. Pronotum elongate, sides much deflexed, anterior border parabolic, posterior border slightly produced; dull orange, with heavy, symmetrical castaneous markings. Tegmina much exceeding the abdomen, fusco-testaceous; proximal half of radial vein & the entire anal sulcus deeply fusco-castaneous; radial vein bifurcate at $\frac{2}{3}$ of its length; 18 costals, 7 longitudinal discoidal sectors, anal area greatly elongate. Wings hyaline, costal area fuscous, opaque; mediastinal vein very long, 5-ramose, extending to $\frac{3}{5}$ of the costal border; 11 costals, stout, distally not incrassated; radial vein simple; median vein simple, slightly sinuous; ulnar vein 4-ramose, all branches going to the apex, a few short venules

arising from its middle course & going to the dividing vein, reminding thus of *Ischnoptera*: apical triangle present, but small; 1st axillary 4-ramose. Abdomen above & below fusco-testaceous. Supra-anal lamina semi-circular. (Cerci missing.) Sub-genital lamina rounded. Mid & hind-legs strongly armed, dull testaceous. (Fore-legs missing.)

♀. Total length 13,5 mm; body 8 mm; pronotum 3×3 mm; tegmina 10,5 mm. (Type Mus. Stockholm.)

The systematic position of this species is uncertain, as both fore-legs are missing, but its venation is very similar to that of *N. radicifera* mihi, the markings of the pronotum also reminding of that species, though being more complicated.

Margattea contingens WALKER.

2 ♂♂, 2 ♀♀ Medan.

As I have pointed out in Bull., Raffles Museum, No. 1, p. 21 (1928), this species has nothing to do with *M. humeralis* WALKER, though SHELFORD regarded the two species as synonymous. The type of *M. contingens* (♀), which is in the Oxford Museum, came from Sarawak (WALLACE's collection), & I am not aware that this species has since been taken again. *M. humeralis*, on the other hand, is fairly common, & I have seen examples from Singapore, the Malay Peninsula, & Sumatra.

The specimens from Medan show between & parallel to all the veins of the tegmina double rows of most minute punctures which in the type are only here & there discernible.

Margattea latius-vittata BRUNNER.

2 ♂♂, 2 ♀♀ Medan.

So far recorded from Singapore, Java, Macassar & the Mentawi Is. only. (See my 'Spolia Mentawiensia: Blattidæ', in Bull., Raffles Museum, No. 1, p. 23 (1928).)

Margattea nimбата SHELFORD.

2 ♂♂, 2 ♀♀ Medan; 1 ♀ Tjinta Radja.

Originally described from Sarawak; common on Singapore Island, the Malay Peninsula, & the Mentawi Is.

Margattea reticulata FABR.

1 ♀ Medan (with egg-case).

Previously recorded from Madras, Siam & Singapore. (See my 'Blattidæ from Southern Annam', J., Siam Soc., Vol. VII, p. 11 (1927).)

Margattea setifera n. sp.

2 ♀♀ Medan.

♀ Short, broad. — Head exposed, testaceous, with a castaneous spot on the vertex & castaneous vermiculations on the face; eyes apart barely $\frac{1}{3}$ the width of the head; antennæ testaceous. Pronotum broad, anterior margin parabolic, posterior margin nearly straight; disk pale testaceous, with a few castaneous vermiculations; lateral margins broad, hyaline. Tegmina just exceeding the apex of the cerci, semi-hyaline, with regularly arranged rectangular maculae of pale orange filling up the spaces between veins & transverse venules, especially in the middle of each tegmen, & with numerous small dark spots in the distal half of each tegmen, each spot with a single slanting short seta arising from it; costal area broad, nearly $\frac{1}{2}$ the width of the tegmen; 11 costals, the first 8 simple, the others ramose; 5 longitudinal discoidal sectors; anal sulcus with a continuous orange line on either side; 7 anal veins, the orange maculae lying between them being almost continuous. Wings hyaline, colourless; mediastinal vein 2-ramose; 8 costals, the first 5 simple, terminally thickened, the others ramose, not thickened; radial vein simple, straight; median vein simple; ulnar 5-ramose; apical triangle small; 1st axillary 3-ramose. Abdomen above & below testaceous, with lighter & darker blotches. Supra-anal lamina narrow, transverse. Cerci testaceous, hirsute. Sub-genital lamina broad, posterior border with a small median indentation. Legs testaceous, strongly armed; front femora with a few stout spines, followed by a series of minute piliform spines. (Type B.)

♀. Total length 12,5 mm; body 9,5 mm; pronotum $3 \times 4,5$ mm; tegmina 9,5 mm. (Type Mus. Stockholm.)

The paratype, also ♀, has the vermiculations of the pronotum & the orange markings of the tegmina much less distinct than the type.

Readily distinguished from the other species of *Margattea* by the setose character of its tegmina.

Very destructive to books. (MJÖBERG.)

Eoblatta notulata STÅL.

2 ♂♂, 1 ♀ Medan.

A widely distributed species (Malay Peninsula, Borneo, Java, Cocos Keeling Is., Formosa, Tahiti, Hawaii), & now recorded for the first time from Sumatra. I have also seen a long series from the Kei Islands (H. C. SIEBERS, 1922).

Chorisoblatta diagrammatica HANITSCH.

1 ♀ Medan.

I first described this species under the name of *Phyllodromia diagrammatica* from a specimen of doubtful origin in the Buitenzorg Museum, but have since recorded it from Singapore, the Malay Peninsula & the Mentawi Islands. I have also seen an example from Pakan Baroe, Siak (I. B. Corporaal, Dec. 1919).

Chorisoblatta picturata SHELFORD.

1 ♂ Medan; 1 ♂ Tjinta Radja.

The only previously known example of this species is the type, ♂, from the Botanic Gardens, Singapore, which is now in the Oxford Museum.

Ceratinoptera klossi HANITSCH.

J., F. M. S. Museums, Vol. VIII, p. 68 (1919); J., M. B., R. Asiat. Soc., Vol. I, p. 419 (1923).

1 ♀ Tjinta Radja.

This species had not been taken again since I described an example, ♂, from Sungei Kring, Korinchi Peak, Sumatra, 7,300'.

*Epilamprinae.**Pseudophoraspis nebulosa* BURMEISTER.

1 ♂ Medan; 1 ♂ Tjinta Radja; 1 ♀ Bah Lias; 1 ♀ Perdagangan.

Common throughout Malaysia.

Rhabdoblatta procera BRUNNER.

3 ♀♀ Medan; 1 ♀ Kota Tjane.

So far recorded from Sumatra, Java, Borneo & Nias, but also common on the Malay Peninsula from where I have seen examples taken by Messrs C. BODEN KLOSS, H. M. PENDLEBURY, H. C. ABRAHAM & J. BANGGA.

Rhienoda rugosa BRUNNER.

1 ♂ Medan.

Distributed over the whole of Malaysia, Pegu, Tenasserim etc.

*Blattinae.**Platyzosteria soror* BRUNNER.

1 ♀ Medan.

This is the first record from Sumatra. Previously known from the Malay Peninsula, Borneo, Formosa, Amboina etc.

Blatta concinna DE HAAN.

1 ♀ Medan.

This widely distributed species had not before been recorded from Sumatra, though I have also seen specimens taken by Mr. E. JACOBSON on the West Coast (Fort de Kock, & Anei Kloof, 1924—26). Known from the Malay Peninsula, Java, Borneo, Annam, Hongkong, Japan, Australia.

Periplaneta americana L.

3 ♂♂, 1 ♀ Medan.

Cosmopolitan.

Periplaneta australasiae FABR.

1 ♂, 3 ♀♀ Medan.

Cosmopolitan.

Periplaneta niveipalpis HANITSCH.

Sarawak Museum J., Vol. III, p. 96 (1925); J., Siam Soc., Vol. VII, p. 24 (1927).

1 ♂, 2 ♀♀ Medan.

This is the first record from Sumatra. Previously known from Sarawak & Saigon only.

Periplaneta robinsoni HANITSCH.

J., S. B., R. Asiat. Soc., No. 69, p. 111, pl. IV, fig. 23 (1915).

1 ♂ Sibolangit; 1 example (sex? abdomen missing) Medan.

This is the second record from Sumatra. Not known from elsewhere.

Periplaneta truncata KRAUSS.

2 ♀♀ Medan; 1 ♀ Brastagi.

Recorded by REHN from Batu Sangkar, Padangsche Boventland, Sumatra, but possibly cosmopolitan. — The Brastagi

specimen measures only 27 mm in total length & is unusually dark in colour, but its supra-anal lamina agrees with that of the type, viz. »triangularis, breviter excisa».

Homalophilpha decorata SERVILLE.

1 ♂ Medan.

Also taken by Mr. E. JACOBSON at Fort de Kock, Sumatra, 920 m, 1922—26. These are the first records from Sumatra. Previously known from Sarawak only.

Archiblatta havenii VOLLENHOVEN.

1 nymph, Medan; 1 nymph, Volcano Sibajak. Distribution: the whole of Malaysia.

Protagonista aterrima n. sp.

1 ♀ Bandar Baroe.

♀. Deep black. — Head exposed, deep black, finely punctured, vertex with 3 longitudinal shining callosities; eyes far apart; antennæ black, pubescent, terminal joints creamy-white. Pronotum rectangular, longer than broad, margins thickened & raised, a transverse ridge before the middle, a median longitudinal ridge in the posterior half; deep black; closely & deeply punctured, with numerous long erect setæ. Tegmina short, just exceeding the metanotum, deep black, coarsely pitted, with scattered setæ. Wings much reduced. Abdomen above deep black, shining, with scattered setæ; abdomen below shining black, setæ fewer. Cerci testaceous, apex black. Left midleg long, slender (all other legs missing); coxa black, distally testaceous; femur cylindrical, long, slender, black, with a few scattered spines; tibiæ heavily spined, dark chestnut, spines reddish chestnut; metatarsus about as long as the remaining joints, spined along the whole of its length.

♀. Total length 16 mm; pronotum 5×4,5 mm; tegmina 4,5 mm. (Type Mus. Stockholm.)

Closely allied to *P. pertristis* mihi, from the Malay Peninsula, of which also only the ♀ is known, but differing from it by its black, instead of castaneous, tegmina. The species of *Protagonista* described so far are:

P. lugubris SHELFORD¹, ♂, from Tonkin: tegmina & wings exceeding the abdomen;

P. fusca mihi², ♂ from Sarawak: tegmina & wings exceeding the abdomen;

¹ Ann. Mag. Nat. Hist. (8), Vol. I, p. 158, pl. IX, fig. 1 (1908).

² Sarawak Museum J., Vol. III, p. 98, fig. 11 (1925).

P. pertristis mihi¹ ♀, from the Malay Peninsula; tegmina & wings reduced;

P. aterrima mihi ♀, from Sumatra: tegmina & wings reduced.

We may thus conclude that the ♂♂ of this genus have always fully developed, & the ♀♀ reduced tegmina & wings.

Panchlorinae.

Pyenoscelus (= *Leucophæa*) *surinamensis* L.

Numerous examples from Medan, Tjinta Radja, Arnhemia, & Kota Tjane.

Cosmopolitan.

Pyenoscelus (= *Leucophæa*) *niger* BRUNNER.

2 ♀♀ Medan; 1 ♀ Arnhemia.

Originally described from Burma, subsequently recorded from Sumatra (REHN), & Java (Oxford Museum).

Corydinae.

Ctenoneura major HANITSCH.

Sarawak Mus. J., Vol. III, p. 102 (1925); J., Siam. Soc., Vol. VII, p. 26 (1927).

2 ♂♂ Sibajak, 1600 m.

Previously known from Sarawak & S. Annam only.

Holocompsa debilis WALKER.

4 examples, Medan.

So far recorded from Sarawak, Java, Penang, & Ceylon only, but also taken by Mr. E. JACOBSON at Fort de Kock, Sumatra, 920 m (1926), & by Captain PENDLEBURY at Kuala Lumpur, Malay Peninsula.

Oxyhaloinae.

Diploptera dytiscoides SERVILLE.

2 examples, Medan.

This is the first record from Sumatra, though this species is distributed from Ceylon, Burma, the Malay Peninsula & Sarawak to the Philippines, Australia, Honolulu & Tahiti. Curiously enough not yet reported from Java.

¹ J., M. B., R. Asiat. Soc., Vol. I, p. 444, fig. 28 (1923).

Chorisoneura lativitrea WALKER.

1 example, Medan.

Not before recorded from Sumatra, though taken by KARNY & SIEBERS at Wai Lima, Lampong (Nov.—Dec. 1921), & by E. JACOBSON, at Fort de Kock, 920 m (1922—25). Previous records are Cambodia, Sarawak & Singapore, to which I can add Kota Tinggi, Johore (V. KNIGHT, Aug. 1917), & Kuala Lumpur (H. M. PENDLEBURY, Sept. 1924).

Chorisoneura apicalis n. sp.

1 ♂ Medan; 1 ♀ Boeloe-Tjina.

As the single ♂ from Medan is mutilated, the following description is based upon the ♀ from Boeloe-Tjina.

♀. Pale, fusiform. — Head much exposed, triangular, dull cream-white, a narrow horizontal brown line between the eyes; eyes far apart; antennæ exceeding the body, pale testaceous. Pronotum sub-circular, posterior border nearly straight, disk dull creamwhite, lateral margins broad, hyaline. Tegmina exceeding the body, fusiform, apex pointed; hyaline, faintly green, apex with a small dark brown spot; costal area broad, 15 costals, radial vein single, 5 longitudinal discoidal sectors, anal area small, about 5 indistinct anal veins. Wings pellucid, almost colourless, a faint tinge of orange along costal border & apex; mediastinal vein simple, ending in the middle of the costal margin; radial vein simple; 12 costals, pale yellowish; costal area narrow; median vein distinguishable only at the very apex; ulnar vein bifurcate at $\frac{3}{4}$ from its base, the anterior branch straight, the posterior branch curved; apical triangle conspicuous; 1st axillary vein 4-ramose, the first branch at its end bent backwards. Body testaceous, darker dorsally. Supra-anal lamina (♀) produced, deeply emarginate. Cerci long, pointed, testaceous. Sub-genital lamina ample, rounded, entire. Legs pale testaceous; front femora with a few delicate spines; mid-femora distinctly spined; hind femora with only a very few delicate spines.

♀. Total length 11,8 mm; body 10 mm; pronotum $2,1 \times 3$ mm; tegmina 10 mm. (Type Mus. Stockholm.)

Areolaria feberi BRUNNER.

1 ♂ Medan.

Previously recorded from Java, Penang & Singapore. I took an example on Gunong Angsi, Malay Peninsula, 2500', April 1918.

Perisphærinæ.

Paranauphæta javanica SAUSSURE.

1 ♀ Sinabong.

Hitherto known from Java only.

Paranauphæta lyrata BURMEISTER.

1 ♂ Pekan Baroe; 1 ♀ Bah Lias; 1 ♀ Medan.

Distributed over the whole of Malaysia, India, Philippines & Celebes.

Panesthinæ.

Salganea morio BURMEISTER.

2 ♀♀ Bah Lias; 1 ♀ Singalang.

Known from the whole of Malaysia, Ceylon, Formosa, & Amboina.

Panesthia javanica SERVILLE.

Numerous examples from Bah Lias, Medan, Pulu Perhala, Sibolangit, Singalang, & Kota Tjane.

Common throughout Malaysia, Burma, Cambodia & the Philippines.

Oxford, January 1929.

Postscriptum. Since I completed this paper some 4 or 5 months ago, MORGAN HEBARD's important »Studies in Malayan Blattidæ» (Proc. Acad. Nat. Sci., Philadelphia, Vol. LXXXI, pp. 1—109 (1921)) have appeared. The changes in classification proposed in those »Studies» are much too profound to be adequately noticed and incorporated whilst reading a proof, & I must postpone due consideration of them until I have concluded my work on other collections of Blattidæ from Sumatra, especially that by E. JACOBSON from the West Coast, and by Dr. H. H. KARNY and H. C. SIEBERS from the South.

Oxford, June 1st 1929.

Tryckt den 26 juni 1929.

XVIII. *The Rhopalocera of the Mt. Everest 1921 Expedition.*
By N. D. RILEY.

[Read October 18th, 1922.]

PLATES XXXVI, XXXVII.

THE following list is in some respects disappointing, a number of species, such as *Parnassius imperator augustus*, *Polygonia interposita agnicula*, etc., which one would expect to find, not being represented in the collection at all. On the other hand, the seven (possibly eight) new species and forms collected represent a very fair percentage on a total of only thirty-three (or possibly thirty-four) species obtained altogether by the Expedition. Nearly all the new forms are from the comparatively lower regions—such as Kharta, Nyenyam and the Rongshar Valley, the upper ends of deep gorges which cut through the Himalayas from Nepal. It would be difficult to explain the presence, within a few miles of Mt. Everest, of such species as *Catopsilia crocale* and *Colias fieldi* were it not for the existence of these valleys.

The highest altitude at which Rhopalocera were collected was at 18,500 ft., at the camp on the moraine shelf above the Rongbuk Glacier a short distance N.N.W. of Mt. Everest. Here *Parnassius acco* and *epaphus* and *Vanessa caschmirensis* and *ladakensis* were met with, but no other species. Above it Rhopalocera do not seem to exist anywhere in the Indo-Tibetan frontier region.

The specimens collected by Mr. A. F. R. Wollaston are indicated by (W.); these have become the property of the British Museum (Nat. Hist.). Those collected by Mr. Bullock and presented by him to the Hope Department, Oxford University Museum, are indicated by (B.). The third collection, made by Major Morshead, who was attached to the Expedition, is in the possession of Colonel Evans, who has very kindly sent me a list of it, which is appended.

My thanks are due to Prof. Poulton for allowing me to work out Mr. Bullock's collection, and for duplicates, and also to Mr. Wollaston for the following note on the localities. Further details on this last point can be found in the Journal of the Royal Geographical Society.

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"Specimens taken before June 25th and all those labelled '*Tingri*' came from open stony plains at an altitude of between 13,000 and 15,000 ft. Weather bright and rainless. Vegetation very scanty. Dwarf plants only found.

" '*Rongbuk Glacier*' and '*East Rongbuk Glacier*.' On the north side of Everest; rounded stony mountains bare of snow up to about 19,000 ft. in July. Vegetation very sparse. Fog and snow in latter part of month.

" '*Thung La*.' Similar to Rongbuk.

" '*Nyenyam*,' '*Lapchi*' and '*Rongshar*.' Between 12,000 ft. and 13,000 ft., west of Mt. Everest. These places are in the upper parts of deep gorges which cut through the main range of the Himalaya, and are within a mile or two of the upper limit of subtropical vegetation of a Nepalese character.

" '*Kharta*' is similar to '*Nyenyam*,' etc., and is situated about twenty-four miles due east of Mt. Everest. Vegetation partly Tibetan, partly subtropical, in character. Weather mostly wet in August and September."—A. F. R. WOLLASTON.

PAPILIONIDAE.

1. *Papilio machaon sikkimensis* Moore.

1903. *Papilio sikkimensis* Moore, Lep. Ind., vi, p. 44.

1907. *P. machaon* race *sikkimensis* Bing., Fauna Br. Ind. Butt., ii, p. 36.

1909. *P. machaon sikkimensis* Jordan, in Seitz Macro-Lep., ix, p. 47.

1912. *P. machaon sikkimensis* Evans, List Ind. Butt., Journ. Bombay N. H. Soc., xxi, p. 971.

Tibet Road, between Gautsa and Phari, 13,500 ft., 29/5/21 (*Bullock*).

1 ♂, 1 ♀, both very battered.

2. *Parnassius acco gemmifer* Frühst.

1901. *Tadumia acco* Moore, l.c., v, p. 116. (part).

1907. *Parnassius acco* Bing., l.c., ii, p. 129. (part).

1909. *P. acco gemmifer* Frühst., in Seitz, ix, p. 110.

1912. *P. (Tadumia) acco gemmifer* Evans, l.c., p. 974.

1 ♂, above Rongbuk Glacier, 17,400 ft., 6/7/21 (*Bullock*).

2 ♂, 6 ♀, Thung La, 16,000 ft., 14/7/21 (*Wollaston*).

4 ♂, 2 ♀, Thung La, 14,000 ft., 15/7/21 (*Wollaston*).

3. *Parnassius epaphus* Oberthür.

1909. *Parnassius epaphus* Bing., l.c., p. 120.

1912. *Parnassius epaphus* Evans, l.c., p. 974.

(a) *P. epaphus everesti*, ssp. nov.

(Pl. XXXVI, fig. 7 ♂, fig. 8 ♀).

1 ♂, 30/6/21; 3 ♂, 1 ♀, 2/7/21; 2 ♂, 6/7/21; 2 ♂, 1 ♀, 7/7/21, 17,400 ft.; 3 ♂, 5 ♀, 14/7/21; 1 ♂, 2 ♀, 18/7/21, 18,500 ft. All "at camp N.N.W. of Mt. Everest on moraine shelf above Rongbuk Glacier" (*Bullock*).

A small but very well-defined local race. About the same size as *sikkimensis* Elwes and *phariensis* Avinoff, but differing from both of these, more particularly from the latter, in the greater opacity of the white ground-colour and the marked reduction of the black marginal markings of both wings. In the ♂ the submarginal lunules on the hind-wing are almost absent and in the ♀ only very slight, and the same applies to the submarginal series of the fore-wing, but to a lesser extent. The red markings are large and conspicuous on both surfaces, much as in *phariensis*.

The race shows a very distinct approach to the more northerly forms *altynensis* Staud. and *nanchanica* Aust.

(b) *Parnassius epaphus himalayanus*, ssp. nov.

(Pl. XXXVI, fig. 6 ♂).

2 ♂, 17,000 ft., 8/8/21; 1 ♂, 16,700 ft., 6/8/21, Camp 9 miles E. of Everest, (*B.*).

1 ♂, Chog La, between Kharta Valley and Karna Valley, 8/8/21 (*W.*).

1 ♀, Rongshar Valley, 14,000 ft., 28/7/21 (*W.*).

♂. Approaches *sikkimensis* in general appearance very much more than does the preceding form, being more transparent and greyer. The submarginal band on the fore-wing is the most characteristic feature, the black lunules of which it is composed being so much increased in size as to form a continuous only slightly dentate band equal in width to the marginal band. The corresponding band on the hind-wing is similarly very conspicuous, and formed of very well-defined large wedge-shaped black marks. The fore-wing is devoid of red markings; the hind-wing has only the costal and discal spots red-centred.

In the ♀ the ground-colour is rather more opaque, but there is no black suffusion. The upper costal spot on fore-wing is red-centred, and, on the hind-wing, the basal spot as well.

The range of this subspecies is most probably east and west along the Himalayas; that of the preceding subspecies northward through Tibet.

4. *Parnassius hardwickii* Gray.

1901. *Parnassius hardwicki* Moore, *l.c.*, v, p. 111.

1907. *Parnassius hardwickei* Bing., *l.c.*, ii, p. 121.

1909. *P. hardwicki* Frühst., in Seitz, ix, p. 111.

1912. *P. hardwickii* Evans, *l.c.*, p. 974.

1 ♂, Nyenyam, W. of Everest, 12,500 ft., 17/7/21 (W.).

1 ♀, Rongshar Valley, W. of Everest, 14,000 ft., 28/7/21 (W.).

Both in excellent condition.

5. *Parnassius delphius lampidius* Frühst.

1903. *Parnassius delphius lampidius* Frühst., *Iris*, p. 44.

1907. *Parnassius delphius* race *whitei* Bing., *l.c.*, ii, p. 125.

1912. *Parnassius lampidius* Frühst., in Seitz, ix, p. 110.

1 ♂, Thung La, 14,000 ft., 15/7/21 (W.).

PIERIDAE.

6. *Pieris brassicae nepalensis* Doubl.

1904. *Danaus brassicae* Moore, *l.c.*, vi, p. 127.

1907. *Pieris brassicae* Bing., *l.c.*, ii, p. 170.

1910. *P. brassicae nepalensis* Frühst., in Seitz, ix, p. 139.

1912. *P. brassicae* Evans, *l.c.*, p. 976.

1 ♂, Kharta, 12,000 ft., 2/9/21 (W.).

7. *Pieris chumbiensis* de N.

1904. *Parapieris chumbiensis* Moore, *l.c.*, vi, p. 143.

1907. *Pieris chumbiensis* Bing., *l.c.*, ii, p. 174.

1910. *Parapieris chumbiensis* Frühst., in Seitz, ix, p. 140.

1912. *Pieris (Parapieris) chumbiensis* Evans, *l.c.*, p. 976.

1 ♂, between Gautsa and Phari, 13,500 ft., 29/5/21 (B.).

8. *Baltia butleri sikkima* Frühst.

1910. *Baltia sikkima* Frühst., in Seitz, ix, p. 138.

1912. *Baltia butleri sikkima* Evans, *l.c.*, p. 975.

1 ♂, 10 miles E. of Tatzang, 17,000 ft., 4/6/21 (B.).

Only very doubtfully separable from *B. butleri butleri* from Ladak and Cashmere.

9. *Colias cocandica tibetana*, ssp. nov.

(Pl. XXXVI, fig. 9.)

1915. *Colias cocandica* Evans, J. Bombay N. H. Soc., xxiii, p. 534.

2 ♂, Nyenyam, 13,000 ft., 19/7/21 (W.).

♂. *Upperside, fore-wing*: pale grey with only a very slight greenish suffusion. The light internervular spots in the broad marginal black band produced as fine rays which reach the margin. Hind-wing darker grey and rather greener, internervular pale spots not so well defined, a large pale area at cell end. Cilia white. *Underside*: the hind-wing and the apical area of fore-wing a beautiful deep green, the submarginal spots of both wings rather ill-defined, rust-coloured except in 1b and 2 of fore-wing where they are black. Discocellular spot on fore-wing small, white centred; on hind-wing larger, pure white, nearly surrounded by a rusty area which is produced towards margin in area 4.

This race is a great deal more like typical *cocandica* than is the Ladak representative (*C. thrasibulus* Früh.), but readily separable by its very grey appearance, which contrasts strongly with the markedly green upperside of *cocandica*. It is an approach to *nebulosa* Ob. from W. China, and probably is the same race of *cocandica* as that referred to and figured by Evans (*l.c.*) from the Tsang-Po, E. Tibet, at an altitude of 14,000 ft., collected by Capt. Bailey.

10. *Colias fieldi edusina* Felder.

1907. *Colias croceus* race *fieldi* Bing, *l.c.*, ii, p. 243. (part).

1909. *Eurymus fieldi* Swinhoe, in Moore, *l.c.*, vii, p. 171.

1910. *Colias fieldi edusina* Frühst., in Seitz, ix, p. 165.

1912. *Colias fieldii edusina* Evans, *l.c.*, p. 979.

2 ♂, 2 ♀, between Kharta and Chung Pu, 13,000 ft., 28/7/21; 2 ♀, 30/7/21; 1 ♂, 1 ♀, 31/7/21, Kharta, 12,000 ft. (B.).

1 ♀, 7/8/21; 1 ♂, 14/8/21; 5 ♂, 19/8/21; 5 ♂, 20/8/21; 2 ♂, 21/8/21, Kharta, 12,000 ft.; 3 ♂, 17/7/21, Nyenyam, 12,500 ft.; 1 ♂, 28/7/21, Rongshar Valley, 14,000 ft. (W.).

A very constant series except as to size; 14,000 ft. seems to be about the highest point this species reaches in any part of its distribution.

11. *Colias berylla* Fawcett.

1907. *Colias ladakensis* race *berylla* Bing., *l.c.*, ii, p. 236.

1909. *Eurymus berylla* Swinhoe, *l.c.*, vii, p. 169.

1910. *Colias berylla* Frühst., *l.c.*, ix, p. 165.

1912. *Colias ladakensis berylla* Evans, *l.c.*, p. 979.

2 ♂, 26/6/21; 1 ♂, 7/7/21, Tingri, 14,000 ft. (W.).

All three absolutely typical.

12. *Colias dubia* Elwes.

(Pl. XXXVII, figs. 1-5.)

1907. *Colias dubia* Bing., *l.c.*, p. 239.

1909. *Eurymus dubia* Swinhoe, *l.c.*, vii, p. 167.

1910. *Colias dubia* Frühst., *l.c.*, ix, p. 165.

1912. *Colias dubia* Evans, *l.c.*, p. 979.

1 ♀, N.E. of Mt. Everest, E. of Deva La, 27/7/21, 16,000 ft.

Upperside, fore-wing: clear orange, paler below costa, apex and margin broadly black, the enclosed light markings paler orange, not at all uniform as to size, *i. e.* that in area 2 by far the largest, those in areas 1a, 4 and 5 equal and about half the size, the remainder very narrow; *hind-wing*, similar in ground-colour, largely suffused with blackish especially towards costa, but by no means entirely black; marginal markings in areas 5, 4 and 3 large and conspicuous, the remainder indistinct, merged into the smoky orange of the disc of the wing; discocellular spot bright orange, large. *Underside*: costa, apex, and outer margin of fore-wing and whole of hind-wing bluish green, not yellowish, central and basal areas of fore-wing as above, discocellular spot of hind-wing small, white, situated on the inner edge of a small diffuse purple patch, sub-marginal series very indistinct, brownish grey except in areas 1a-3 of fore-wing in which they are very conspicuous and black.

This female agrees much better in all respects with the ♂ type of *C. dubia* Elwes (P.Z.S., p. 481, 1906) than does the ♀ which Elwes then associated with his ♂, and can safely be assumed to be the true ♀ of that species. With it, as *C. dubia*, should be associated the *Colias* figured by

Fawcett (P.Z.S., 1904 (2), Pl. 9, fig. 10a, ♀) as *Cobias eogene* var. *leechi* Gr.-Gr., ♀.

The female described by Elwes—which is in the B.M.—as his ♀ type of *dubia* is really a ♀ of *C. miranda* Frühst., and it agrees with the types of that form which are also in the B.M. For the sake of comparison the actual type specimens of *C. dubia* and *C. miranda* are here figured.

What is really the status of each of these forms it is difficult to say. The most likely hypothesis seems to be that *C. miranda* is the Himalayan, *C. dubia* the more truly Tibetan representative of *C. eogene*, to the Ladak form of which (*stoliczkana*) they show most resemblance.

13. *Catopsilia crocale* Cramer.

1907. *C. crocale* Bing., l.c., p. 219.

1909. *C. crocale* Swinhoe, l.c., vii, p. 88.

1910. *C. crocale* Frühst., l.c., ix, p. 162.

1912. *C. crocale* Evans, l.c., p. 979.

1♀, Lapchi, 12,500 ft., 22/7/21 (W.).

Rarely seen above 12,000 ft., on the southern slopes of the Himalayas only. (Lapchi is just at the upper limit of subtropical Nepalese vegetation.—A.F.R.W.)

NYMPHALIDAE.

14. *Argynnis lathonia issaea* Moore.

1900. *Rathora issaea* Moore, l.c., iv, p. 241.

1905. *A. lathonia* race *issaea* Bing., l.c., i, p. 441.

1912. *A. lathonia issaea* Frühst., l.c., ix, p. 514.

1912. *A. (Rathora) lathonia issaea* Evans, l.c., p. 582.

1 ♂, Nyenyam, 12,500 ft., 17/7/21 (W.).

15. *Argynnis pales eupales* Frühst.

1905. *Argynnis pales* Bing, l.c., i., p. 447. (part).

1912. *Boloria pales eupales* Frühst., l.c., ix, p. 512.

1 ♂, Nyenyam, 13,000 ft., 19/7/21 (W.).

16. *Argynnis eugenia rhea* Gr.-Gr.

1908. *A. eugenia rhea* Seitz, i, (Pal.), p. 233.

2 ♂, 1 ♀, E. of Doya La, 16,000 ft., 27/7/21 (B.).

1 ♀, Doya La, 16,700 ft., 1/8/21; 1 ♂, Rebu, 14,000 ft., 1/8/21; 2 ♂, 1 ♀, Kharta, 14,500 ft., 5/8/21 (W.).

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1 ♀, Valley bottom 10 miles E. of Everest, 14,000 ft., 9/8/21 (B.).

Specimens taken at 16,000 ft. and above are much the smallest.

17. *Argynnis clara manis* Frühst.

1900. *Boloria clara* Moore (part), *l.c.*, iv, p. 253.

1905. *A. clara* race *manis* Bing., *l.c.*, i, p. 443.

1912. *A. clara manis* Frühst., *l.c.*, ix, p. 514.

1912. *A. (Boloria) clara manis* Evans, *l.c.*, p. 582.

1 ♂, E. of Doya La, 16,000 ft., 27/7/21, (B.).

18. *Melitaea sindura tibetana* Fawcett.

1905. *M. sindura* race *sikkimensis* f. *tibetana* Bing., *l.c.*, i, p. 453.

1912. *M. sindura tibetana* Frühst., *l.c.*, ix, p. 511.

1 ♂, E. of Doya La, 16,000 ft., 27/7/21 (B.).

19. *Vanessa chinensis* Leech.

1908. *V. urticae chinensis* Stichel, in Seitz, i, p. 203.

1 ♀, Tibet Plateau, between Kishong and Shigar Jong, 14,000 ft., 16/6/21 (B.).

20. *Vanessa caschmirensis aësis* Frühst.

1899. *Aglais kaschmirensis* Moore, *l.c.*, iv, p. 87.

1905. *Vanessa caschmirensis* Bing., *l.c.*, i, p. 367.

1912. *V. caschmirensis aësis* Frühst., *l.c.*, ix, p. 527.

1912. *Vanessa (Aglais) cashmirensis* Evans, *l.c.*, p. 579.

1 ♀, 30/6/21, 17,400 ft.; 1 ♂, 16/7/21, 18,000 ft., N.N.W. of Everest, above Rongbuk Glacier; 2 ♂, Kharta, 12,000 ft., 30/7/21 (B.).

21. *Vanessa ladakensis* Moore.

1899. *Aglais ladakensis* Moore, *l.c.*, iv, p. 90.

1905. *Vanessa ladakensis* Bing., *l.c.*, i, p. 368.

1912. *V. urticae ladakensis* Frühst., *l.c.*, ix, p. 527.

1912. *V. (Aglais) ladakensis* Evans, *l.c.*, p. 579.

1 ♂, 25 miles N. of Phari, 14,800 ft., 1/6/21; 3 ♂, 7 ♀, 15 miles E. of Tatzang, 15,700 ft., 3/6/21; 1 ♂, above Rongbuk Glacier, 17,400 ft., 30/6/21 (B.).

With regard to the last three species, these records are additional proof that the three are not all forms of *V. urticae*. *Ladakensis* and *caschmirensis* occur throughout the area traversed by the expedition, and dated speci-

mens, including some from other sources in the B.M., show them to be on the wing in that area throughout June and July. *Chinensis* seems only to have been taken in June, the above locality being the most western so far recorded. It was also taken at Gyantse by the Tibet Exp. (1903), so its range well overlaps that of the other two.

SATYRIDAE.

ARGESTINA, gen. nov.

Closely related to *Erebia* and *Callerebia*, having some of the characters of both. In appearance resembling more the former than the latter.

Antennae $\frac{2}{5}$ the length of costa, delicate, the club very broad and spatulate, short, arising rather abruptly. Palpi large, very hairy, as usual in this group. Tibiae and tarsal joints all spiny, but not conspicuously, the last tibial spine the most prominent on each leg. *Wings*, in shape, resembling more *Erebia*. Fore-wing costa arched, but not nearly so much as in *Callerebia*, hind margin conspicuously straight in ♂, more rounded in ♀. Subcostal vein very much swollen at base, median hardly at all. Vein 5, at origin, about equidistant from 4 and 6; 10 invariably arising out of stalk of 7, 8, and 9 well beyond cell end. Of the discocellular veins, the lowest is straight, the middle one very much bowed in, the upper extremely short. Hind-wing very little broader than fore-wing, the anal angle slightly produced towards median line, not extending far beyond extremity of abdomen, the outer margin evenly rounded. In the ♂ the central third of the fore-wing, except anteriorly, is occupied, in all except one species, by an area of very dark brown modified scales, transversely crossed by a number of fine ridges producing the appearance of ripples—a feature also present in some species of *Callerebia*.*

* The following short key seems to separate the Himalayan species of this *Erebia*-like group into fairly natural genera:—

- 1 (2). Fore-wing MDC straight, considerably less than $\frac{1}{2}$ as long as LDC. *Erebia*.
- 2 (1). MDC strongly incurved, as long (or nearly so) as LDC.
- 3 (6). Club of antennae short, stout, arising abruptly.
- 4 (5). Vein 10 free or connate with stalk of 7, 8, and 9 . . . *Paralasa*.
- 5 (4). Vein 10 out of 7, 8, and 9 well beyond cell end . . . *Argestina*.
- 6 (3). Club of antenna long, narrow and arising gradually *Callerebia*.

The generic names *Dallacha* and *Hemadara*, proposed by Moore for his species *hyagriva* and *narasingha* respectively, scarcely seem

Type: *Argestina waltoni* Elwes. (*Callerebia waltoni* Elwes, P.Z.S., p. 482, Pl. 36, f. 14 (♂), f. 15 (♀), 1906.

22. *Argestina karta*, sp. nov.

(Pl. XXXVI, fig. 11 ♂, fig. 12 ♀.)

1 ♂, 2 ♀, 30/7/21; 1 ♂, 31/7/21, Kharta, 12,000 ft. (B.).

♂. *Upperside, both wings*: very dark brown, almost black, the cilia paler, greyish. *Fore-wing* with the marginal area slightly lighter, a minute white-pupilled ocellus in area 5 and a very indistinct submarginal dark line from costa to about vein 3, the ripples on the area of modified scales very inconspicuous. *Underside, fore-wing*: warm chestnut brown, with a darker transverse shade just beyond the cell, the costa, apex, hind margin and tornus darker, grey brown, the apex, as far as ocellus, irrorated with dark ochreous; the ocellus black, reaching from vein 4 almost to vein 7, white pupilled, ringed with pale yellowish. *Hind-wing*: dark greyish, crossed by a basal, a discal and a submarginal very wavy darker line, and with a postdiscal series of 5 white points, the area from base to discal transverse line darker than the discal area, the whole wing densely sprinkled with very dark brown, and with ochreous, the latter more particularly just beyond discal transverse line.

♀. *Upperside, both wings*: much lighter brown than in the ♂. *Fore-wings*: the greater part of the wing, except the margins (more particularly inner margin), suffused warm chestnut brown, which renders the rather larger ocellus and the submarginal line very much more conspicuous. *Underside*: as in the ♂, except that the whole tone of the markings is rather lighter.

Length of fore-wing, ♂ 23 mm.; ♀ 22 mm.

Besides the type species (*waltoni* Elwes) and the species described above, the genus includes *inconstans* South, with its subspecies *gyda* Evans, and a fourth species obtained with *waltoni* by the Tibet Expedition in 1904.*

to be justifiable. Although very aberrant in *facies* these do not seem structurally separable from *Callerebia*.

* *Argestina nitida*, sp. nov. See Appendix II.

23. *Paroeneis grandis*, sp. nov.

(Pl. XXXVI, fig. 10.)

2 ♂, Kharta, W. of Mt. Everest, 12,000 ft., 30/7/21 (B.).

♂. *Upperside*, both wings: rich bright fulvous, the hind margin (broadly), and the veins black; cilia light ochreous, broadly flecked with black at the extremities of the veins. *Fore-wing*: costal area suffused blackish, a black spot in area 5 centrally in the centre of a paler ochreous field, which is continued in a paler band interrupted at the veins, to inner margin. *Hind-wing*: a narrow transverse paler band crosses wing just within the black marginal border, the dark spots on cilia much smaller than on fore-wing. *Underside*: fore-wing pale ochreous, the broad discal band paler, not interrupted at the veins in one specimen, costal, apical, and hind marginal areas grey with numerous short darker striations (the type), interrupted at 2, 3, and 4 in the others. On the hind-wing the outer edge of the black basal area is extremely sinuous throughout its length and bordered by a narrow pale band (1-1.5 mm.). Beyond this, the whole wing surface heavily mottled with black, dark grey, and brown, through which and midway between hind margin and the pale transverse band, runs a very sinuous, interrupted broad black discal line; veins blue grey.

Length of fore-wing, 26-27 mm.

Nearest *P. bicolor*, but readily separated from all other members of the genus by the richness and uniformity of the fulvous coloration of upperside, the blackness of the margins, its size, and the width of the pale band of the underside of the hind-wing, which approaches that of, but remains narrower than in *P. bicolor* Staud.

24. *Paroeneis bicolor* Staud.

1911. *Oeneis pumilus bicolor* Frühst., l.c., ix, p. 311.

1912. *Satyrus* (*Paraeneis*) *pumilus bicolor* Evans, l.c., p. 562.

1 ♀, Nyenyam, 13,000 ft., 19/7/21; 1 ♂, 27/7/21; 1 ♂, 2/8/21, Rongshar Valley, 14,000 ft. (W.).

25. *Paroeneis sikkimensis* Staud.

1893. *Paroeneis sikkimensis* Moore, l.c., ii, p. 38.

1905. *Oeneis pumilus* race *sikkimensis* Bing, l.c., i, p. 129.

1911. *Oeneis palearcticus sikkimensis* Frühst., l.c., ix, p. 311.

1912. *Satyrus (Paraeneis) palearcticus sikkimensis* Evans, l.c., p. 562.

3 ♂, 2 ♀, 3/8/21, 17,000 ft.; 3 ♂, 5/8/21, 16,000 ft., S. of Kharta (W.).

3 ♂, 5 ♀, 6/8/21; 4 ♂, 1 ♀, 8/8/21, 5 miles E. of Everest, 16,700 ft. (B.).

Darker and very much smaller than either of the preceding species.

The specific limits in this genus are rather difficult of definition. The three species mentioned above show an interesting transition in size and coloration as the elevation increases. At Kharta, 12,000 ft., the largest and most richly coloured species in the genus is found (*P. grandis*); in the same region, but at 13,000–14,000 ft., a smaller form scarcely separable from *P. bicolor*, but yet rather larger and more darkly marked than that species, is to be found, considerably smaller than *P. grandis*, but with the same rich fulvous ground-colour, much more suffused with blackish. Higher still, at 16,000–17,000 ft., *P. sikkimensis* is met with; a still smaller insect, having barely two-thirds the wing span of *P. grandis* and much greyer above and below.

The genitalia show corresponding differences. In all the forms examined, the extremity of the clasper in the ♂ consists of a pair of lobes, an upper and a lower, and the tegumen, just below the uncus, bears a pair of large chitinous processes sometimes almost as long as the uncus itself. In *P. grandis* the upper lobe of the clasper is large, blunt and slightly longer than the smaller and much more pointed lower lobe. In *P. bicolor* and *P. sikkimensis*, however, the lower pointed lobe is by far the larger, and the upper blunt lobe, though retaining the outline of that of *P. grandis*, is very much shrunk in size, more particularly in *sikkimensis*, which thus approaches *P. pumilus* (from N.W. Himalayas), in which the upper lobe has entirely disappeared, the upper angle of the extremity of the clasp being merely bluntly rectangular.

P. grandis seems sufficiently distinct to be given specific rank, and the same may be said of *P. pumilus*. The form described by Staudinger as *P. pumilus* f. *bicolor*, however, has much more in common with *sikkimensis* than with *pumilus*, so much so, in fact, that it is extremely difficult, in a long series, to separate them off.

LYCAENIDAE.

26. *Polyommatus arene* Fawcett.

1909. *Lycaena stoliczkana arene* Seitz, i, p. 311.

1910. *Polyommatus ariana* (part) Swinhoe, l.c., viii, p. 26.

1 ♂, between Kishong and Shekar Jong, 14,000 ft., 16/6/21; 2 ♂, 1 ♀, Shekar Jong 14,000 ft., 17/6/21 (B.).

17♂, 7 ♀, Tingri, 14,000 ft., 26/6/21; 1 ♂, 1 ♀, Nyenyam, 12,500 ft., 17/7/21 (W.).

Fresh and very worn specimens were taken together on 17/6/21; fresh specimens again on 17/7/21, whilst all the series from Tingri were taken in beautifully fresh condition. This seems to contradict rather flatly the statement in Lep. Ind., 8, p. 27, that *arene* is the dry-season form of *ariana*, as all the specimens are referable to *arene* and show very little variation indeed. None of the females exhibit more than a trace of blue suffusion on the upperside. The large white wedge-shaped mark arising from the orange lunules of the underside of the hind-wing in areas 3 and 4, and directed basad, as well as the pale ground-colour, separate this species at once from the next.

27. *Polyommatus everesti*, sp. nov.

(Pl. XXXVI, fig. 1 ♂, 2, and 3 ♀.)

1 ♂, 1 ♀, 27/7/21; 1 ♂, 28/7/21, Rongshar, 13,000 ft.; 2 ♂, 1 ♀, Rebu, 14,000 ft., 31/7/21; 5 ♂, 1 ♀, Kharta, 12,000 ft., 7/8/21; 2 ♂, 1 ♀, 19/8/21; 1 ♂, 2 ♀, 20/8/21; 1 ♀, 21/8/21, Kharta, 12,500 ft. (W.).

14 ♂, 3 ♀, between Kharta and Chung Lung Pu, 13,000 ft., 28/7/21; 2 ♂, 1 ♀, 30/7/21; 3 ♂, 2 ♀, 31/7/21, Kharta, 12,000 ft. (B.).

♂. *Upperside, both wings*: brilliant azure blue, the margins narrowly black, inwardly crenulate, cilia long, silvery-white, darker proximally. *Underside, fore-wing*: ground-colour sooty grey, slightly green tinged at the base, the ocelli black with very broad and well-defined white rings, viz. one in cell, just before origin of vein 3, and a discal series of six, the first and the last the smallest; a dark oval broadly white-ringed mark at cell end, the outer white edging produced to form a white cone or Y-shaped mark; a sub-marginal series of suberescient pale grey marks, followed by a

marginal diffuse white line, interrupted by the rather prominent veins; and a dark anteciliary line, eilia as above. *Hind-wing*: ground-colour rather darker than on fore-wings, more brownish, the basal area suffused metallic greenish, a faint white spot in cell followed by a large white broadly wedged-shaped mark, the basis of which is the spot on the discocellulars—*no similar submarginal white mark*. Beyond this a series of 9 ocelli similar to those on fore-wing, the first, in area 1b indistinct, the remainder prominent, the last two both in area 7, the series sinuous from 1 to 6, then bent at right angles, 6, 7, and 8 being in line, 9 towards the base of area 7. Marginal area whitish, well separated from the ocellar series, inwardly diffuse, enclosing a double series of fine black erecents except in area 7, each pair enclosing a faint orange spot. Cilia as above, preceded by a fine dark anteciliary line. The veins prominently paler than the ground-colour.

♀. *Upperside, both wings*: brilliant blue, of a deeper shade than in ♂, the margins and costal areas, especially of fore-wing, broadly and diffusely black, enclosing scattered blue scales. Cilia as in ♂. *Underside, both wings*: as in the ♂, but with no spot in cell on fore-wing, and the marginal pale markings much broader and more diffuse. On the *hind-wing* the inner series of erecentic marks almost obsolete, the outer prominent, the two series more widely separated, the orange more conspicuous.

Length of fore-wing, ♂ 15–19 mm.; ♀ 14–18 mm.

The series exhibits considerable variation. On the upperside in the ♂ the black margins vary in width and as to the definition of the inner edge, especially on the fore-wing; in the ♀ the blue suffusion is in some specimens confined to the base of the wings with only a few scattered scales on the disc, and in these specimens the hind-wing bears a submarginal series of diffuse bluish lunules, which in one specimen are distinctly marked with orange. On the underside, the veins, usually very prominent, do not stand out in all specimens, the ocellus in the cell of the fore-wing is as frequently absent as present, the relative prominence of the ocelli as between each other varies considerably, as also does their size; but their heavy white ring and the extraordinary dark smoky ground-colour are very constant. The orange submarginal markings of the hind-wing, always very pale, in some specimens are barely traceable, in others almost as large as in *P. arene*. The genitalia exhibit marked differences from those of *P. arene*.

28. *Lycaena pheretes pharis* Fawcett.

1910. *Plebeius pharis* Swinhoe, *l.c.*, viii, p. 17.

1 ♂, Thung La, 14,500 ft., 15/7/21; 1 ♂, 1 ♀, Rebu, 14,000 ft., 31/7/21 (W.).

29. *Lycaena asiatica* Elwes.

1907. *Lycaena pheretes* race *asiatica* Bing., *l.c.*, ii, p. 352.

1910. *Plebeius asiatica* Swinhoe, *l.c.*, viii, p. 17.

1912. *Lycaena (Albulina) asiatica* Evans, *l.c.*, p. 983.

1 ♀, E. of Everest, 14,000 ft., 9/8/21 (B.).

Evans and Swinhoe are perfectly correct in treating this as a species distinct from *pheretes*. It is confusingly like that species, but has nothing to do with it in reality.

30. *Lycaena janigena*, sp. nov.

(Pl. XXXVI, fig. 4 ♂, fig. 5 ♀.)

1 ♀, 18/7/21; 1 ♂, 19/6/21, Nyenyam, 13,000 ft. (W.).

♂. *Upperside, both wings*: deep purplish blue, with a roughish appearance, an even black marginal border, 1 mm. wide or slightly more, cilia white. *Underside, fore-wing*: dull grey brown, the basal area pure grey, an angular, white-ringed, dark mark at cell end followed by a discal series of five broadly white-ringed darker spots, those in areas 4 and 5 much displaced outwardly, the uppermost elongate, shifted inwards slightly, a very faint paler submarginal area, no marginal markings, a fine dark anteciliary line, the pure white fringes deeply but narrowly blackened at the ends of the veins, no markings in the cell. *Hind-wing*: ground-colour much darker and browner than fore-wing, basal area greyer, a basal series of four large white spots, in 7, the cell (double and nearly filling the cell), 1c and 1b, a similar very large spot at cell end, and a discal series of 7 the same but oval in shape, contiguous, those in areas 1c to 5 in a straight row towards apex, those in areas 6 and 7 in line with spot in 5 and forming an angle of about 70° to the others, marginal area, except for a small area close to the discal spots diffusely pale grey, cilia as on fore-wing.

♀. *Upperside, both wings*: uniformly sooty brown, with a few scattered blue scales, cilia darker than in ♂. *Fore-wing*: with a small, faint, grey-ringed spot at cell end. *Underside, both wings*: exactly like the ♂, except for a more ochreous general tone, the presence of a sixth spot (in area 1a) in the discal series, and traces of darker marginal markings on the fore-wing.

Eyes smooth; palpi very hairy, moderately long; antennae prominently white-ringed, the club unusually stout, arising rather abruptly. *Fore-wing* costa and inner margin very straight (as in *L. asiatica*), hind margin very convex especially posteriorly. *Hind-wing* evenly rounded. Palpi, thorax, and abdomen below, and legs, light grey.

Length of fore-wing, ♂ 12.5 mm.; ♀ 11.5 mm.

A very distinct little species unlike anything else known to me, but reminiscent of *L. dis.* Gr.-Gr. and *L. luana* Evans on the underside, except for the fore-wing markings and the *pheretes*-like arrangement of the spots on the underside of hind-wing. The blue coloration of the upperside of the ♂ separates it at once from either.

See also supplementary list from Col. Evans (below).

31. *Heodes phlaeas* Linn.

1909. *Chrysophanus phlaeas* Seitz, i, p. 285.

1910. *Chrysophanus phlaeas* Swinhoe, l.c., viii, p. 91.

1912. *Chrysophanus phlaeas* Evans, l.c., p. 989.

2 ♂, 20/7/21; 1 ♀, 7/8/21, Kharta, 12,500 ft. (W.).

Very large and of the *eleus* form—not f. *stygianus* Butler.

APPENDIX I.

Whilst the above specimens were being dealt with, Col. Evans very kindly sent me a list, which I append, of the collection he had received from Major Morshead of the Indian Survey Department, who was attached to the Expedition.

This list increases the total number of species recorded from the area by two for certain (*Argynnis gemmata genia* Frühst. and *Lycaena younghusbandi* Elwes), and adds further localities for most of those already recorded.

The species Col. Evans refers to as *L. stoliczkana* is probably what I have recorded as *L. arene*. Felder's figures and description of *L. stoliczkana* are so unlike any form of *ariana* or *arene*, that it seems at present better not to employ the name for the *icarus*-like form with the very bright blue upperside.

The other doubtful species is *L. morsheadi* Evans. The description of the underside of the hind-wing of this fits exactly

the species described above as *L. janigena*, but the underside of the fore-wing (with a large spot in the cell and a broad white submarginal fascia, etc.), and the coloration of the upperside in the male, are so very different that it does not seem justifiable to unite them at present.

A LIST OF BUTTERFLIES CAUGHT BY MAJOR H. T. MORSHEAD
DURING THE MOUNT EVEREST EXPEDITION 1921.

By Col. W. H. EVANS.

1. *Oeneis pumilus bicolor*. Nyenyam, July 18; Tasam, July 27; Phuse La, July 28; Ratsal, July 31; Chodzung, July 31; Kharta Chu, Aug. 13. Apparently common at elevations of 11,500–16,500 ft.

2. *Vanessa cashmirensis*. Nyenyam, July 16; two of the three specimens obtained were strongly melanitic; at 13,000 ft.

3. *Vanessa ladakensis*. Tingri, June 19; Dokocho, June 26; all three specimens very worn; at 14,000 ft.

4. *Argynnis lathonia issaea*. Nyenyam, July 17, at 12,500 ft.

5. *Argynnis clara manis*. Thong La, July 14; Ratsal, July 31; Doya La, Aug. 1; five specimens at 16,000 ft.

6. *Argynnis pales eupales*. Nyenyam, July 18; one male at 13,500 ft.

7. *Argynnis gemmata genia*. Kang Chu, July 23; a few specimens at 14,000 ft.

8. *Argynnis eugenia rhea*. Tulung, July 15; Nyenyam, July 18; Kang Chu, July 23; Doya La, Aug. 1; a few specimens at 13,500–16,000 ft.

9. *Pieris brassicae nepalensis*. Chuphar, July 27 at 11,000 ft.

10. *Colias fieldii*. Tingri July 10; Nyenyam, July 17; Chuphar, July 27; Tasam, July 27; at 11,000–14,000 ft.

11. *Colias berylla*. Tingri, July 12 at 14,000 ft.

12. *Parnassius epaphus sikkimensis*. A single specimen, Kharta Chu, July 14 at 17,000 ft.

13. *Parnassius acco gemmifer*. Menkhap To, June 28; Lungchen La, June 29; Thong La, July 14; Yalop and Tulung, July 15; Tingri, June 25; at 14,000–17,500 ft.

14. *Lycaena stoliczka*. Common from June 18 to August 12 at from 13,000–15,000 ft.

15. *Lycaena pheretes asiatica*. Ratsal and Chodzung, July 31, at 15,000 ft.

16. *Lycaena younghusbandi*. Menkhap To, June 28; Dokcho, June 26; Ratsal and Chodzong, July 31; a few from 15,000–16,000 ft.

17. *Lycaena morsheadi*, new species. One male, Tasam, 15,500 ft., and one female, Phuse La, 16,000 ft., both on July 28.

Description.

Male, above dark brown, loosely powdered dull blue scales, giving a frosted appearance; a diffused white spot at the end of each cell; border dark brown, $\frac{3}{4}$ millimetre wide; cilia long and white. Female, above, blue scales, very sparse dark border and white cell spots absent. Below fore-wing lead grey, a large white diffused spot in the cell, and, at the end, a contiguous row of large, dark-centred, white spots in 1–6, the last spot being shifted in, a post-discal broad white fascia, submarginal diffused black spots in each space; cilia white prominently chequered with brown at the end of each vein. Below hind-wing dark chocolate brown, but is so covered with very large white spots that the ground-colour can hardly be seen; four basal spots, in 7, double-sized in cell occupying two-thirds of it, in 1 and 1a; discal row of 7 spots, those in 1–5 in a straight line pointing to the apex, 6 and 7 shifted right in; post discal, etc., markings as on the fore-wing. Antennae prominently ringed white and with an unusually large club. Eyes smooth. Palpi unusually long. Apex of fore-wing sharp pointed, but not produced; termen highly convex especially near dorsum; hind-wing evenly rounded. Expanse of male 23 and of female 19 millimetres. The nearest ally to this very distinct little species is the *Lycaena luana* I described from S. E. Tibet in J.B.N.H.S., vol. xxiii; the general appearance below is similar and the hind-wings are much the same; but the chequered cilia, the markings on the fore-wing and the blue colouring above render it easily recognisable.

18. *Chrysophanus phloecas*. Kharta district, Aug. 12, at 13,500 ft.

W. H. EVANS.

APPENDIX II.

1922 COLLECTION.

The following List of the Rhopalocera taken by Dr. Longstaff and Major Norton on the 1922 Mt. Everest Expedition adds several species to the previous list—but

nothing new—and some further localities. The start was made much earlier than in 1921, which accounts for the interesting capture of *Parnassius hunnyngtoni* again, at the end of April; but only a single specimen was obtained, unfortunately. The bulk of the collection comes from the comparatively low-lying valley of the Arun River, at altitudes of 11,000–12,000 ft.; nothing was taken above 17,000 ft. on this occasion.

The species have been numbered as in the List of the 1921 Collection. An asterisk indicates that the species was not obtained in 1921. The letters (N.) and (L.) indicate the captures made by Major Norton and Dr. Longstaff respectively.

1. *Papilio machaon sikkimensis* Moore.

1♂, Samchun La, Kharta, 15,500 ft., 20/6/22 (Major Norton).

1 ♂*, Base Camp, 16,500 ft., 19/5/22 (Dr. Longstaff).

2. *Parnassius acco gemmifer* Frühst.

1 ♂, Dongka La, 17,000 ft., 18/7/22 (N.).

2 ♂, 1♀, Dongka La, 16,000 ft., 19/7/22 (N.).

* 2a. *Parnassius hunnyngtoni* Avinoff.

1916. *Parnassius hunnyngtoni* Avinoff, Trans. Ent. Soc., London, 1915, p. 351.

1♀, Pang La, 17,000 ft., 28/4/22 (L.).

4. *Parnassius hardwickii* Grey.

5♂, 1♀, Samchu La, Kharta, 16,000 ft., 20/6/22 (N.).

1♂, Samchu La, Kharta, 14,500 ft., 3/7/22 (N.).

8. *Baltia butleri* sikkima Frühst.

1 ♀, Phung Chu, Arun Valley, 11,000 ft., 9/6/22 (N.).

* 6a. *Pieris canidia* Spar.

1904. *Danaus canidia* Moore, *l.c.*, vi, p. 133.

1907. *Pieris canidia* Bing., *l.c.*, ii, p. 172.

1910. *Pieris canidia* Frühst., *l.c.*, ix, p. 139.

1912. *Pieris* (*Pieris*) *canidia* Evans, *l.c.*, p. 976.

1 ♀, Phung Chu, Arun Valley, 11,000 ft., 19/6/22 (N.).

* 6b. *Pieris melete melaina* Böber.

1904. *Danaus ajaka* Moore, *l.c.*, vi, p. 132 (part).
 1907. *Pieris napi melete* Bing., *l.c.*, ii, p. 173 (part).
 1910. *Pieris melete melaina* Frühst., in Seitz, ix, p. 140.
 1912. *Pieris melete melaina* Evans, *l.c.*, p. 976.

2 ♂, 1 ♀, Phung Chu, Arun Valley, 11,000 ft., 19/6/22 (N.).

10. *Colias fieldi edusina* Felder.

- 2 ♀, Arun Valley, 11,000 ft., 9/6/22 (N.).
 1 ♂, Arun Valley, 11,000 ft., 14/6/22 (N.).
 1 ♀, Karma Valley, 12,000 ft., 22/6/22 (N.).

* 10a. *Colias nina* Fawcett.

1904. *Colias nina* Fawcett, Proc. Zool. Soc., London, p. 139, Pl. 9.
 1907. *Colias ladakensis* r. *berylla* Bing., *l.c.*, ii, p. 236 (part).
 1907. *Colias berylla* Röber, in Seitz, i, p. 66 (part).
 1909. *Eurymus berylla* var. *nina* Swinhoe, in Moore, vii, p. 169.
 1911. *Colias nina* Verity, Rhop. Pal., p. 350.
 3 ♂, Phung Chu Valley, below Shekar Djong, 14,000 ft., 10/7/22 (N.).

14. *Argynnis lathonia issaea* Moore.

- 1 ♀, Kharta, 12,000 ft., 11/6/22 (N.).
 2 ♀, Phung Chu, Arun Valley, 11,000 ft., 19/6/22 (N.).
 1 ♀, Karma Valley, 12,000 ft., 22/6/22 (N.).

17. *Argynnis clara manis* Frühst.

- 2 ♂, Dongka La, 16,000 ft., 18/7/22 (N.).

18. *Melitaea sindura tibetana* Fawcett.

- 2 ♂, Tinki, 13,500 ft., 15/7/22 (N.).
 1 ♂, Dongka La, 16,000 ft., 18/7/22 (N.).
 1 ♀, above Phari, 15,000 ft., 19/7/22 (N.).

* 18a. *Pyrameis cardui* L.

1905. *Vanessa cardui* Bing., *l.c.*, i, p. 365.
 1 ♂, Transar Chumbab, 13,000 ft., 23/4/22 (N.).
 1 ♂, Phung Chu, Arun Valley, 11,000 ft., 17/6/22 (N.).

20. *Vanessa caschmirensis* aösis Frühst.

1 ♀, Arun Valley, 11,000 ft., 9/6/22 (N.).

21. *Vanessa ladakensis* Moore.

1 ♂, Base Camp, 16,500 ft., 29/5/22 (L.).

1 ♂, Pang La, 15,000 ft., 8/6/22 (L.).

1 ♀, Kharta Chu, 13,000 ft., 12/6/22 (N.).

1 ♂, Phung Chu, 11,000 ft., 15/6/22 (N.).

* 21a. *Polygonia interposita agnicula* Moore.

1899. *Polygonia agnicula* Moore, l.c., iv, p. 99.

1905. *Vanessa c-album* r. *agnicula* Bing., l.c., i, p. 372.

1912. *V. (Polygonia) c-album agnicula* Evans, List, l.c., p. 580.

1921. *P. interposita agnicula* Riley, Ann. Mag. Nat. Hist. (9), viii, p. 596.

1 ♀, Arun Valley, 11,000 ft., 9/6/22 (N.).

1 ♂, Arun Valley, 11,000 ft., 14/6/22 (N.).

22. *Argestina karta* Riley.

2 ♂, 1 ♀, Pang La, 15,000–16,000 ft., 8/6/22 (L.).

3 ♂, Arun Valley, 11,000 ft., 9/6/22 (N.).

1 ♀, Chushar, 14,500 ft., 13/6/22 (L.).

* 22a. *Argestina nitida* sp. nov.

(Pl. XXXVII, figs. 6–8)

1 ♀, Pang La, 15,000–16,000 ft., 8/6/22 (L.).

♂. *Upperside, both wings*: uniformly dark glossy brown with greenish and purplish reflections in certain lights, the cilia light grey with darker markings at the extremities of the veins. *Fore-wing*: no trace of any area of modified scales, or submarginal line, the ocellus present in area 5 but minute. *Underside*: markings arranged as in *waltoni* and *karta*, but the warm chestnut brown of underside of fore-wing is replaced by dull coppery, and the irrorated appearance of the apical area is continued the whole length of the costa, and the yellowish ring of the ocellus is barely discernible: on the *hind-wing*, the three transverse wavy lines are completely lost in the mottled dark brown and ochreous, and the postdiseal row of white points is increased to six in number by the addition of a point in area 1c.

♀. Exactly resembles the ♂ both above and below, except for the

greater size and the increased prominence of the ocellus, which, in the only specimen of this sex obtained, has two white pupils, and for the suffusion of the greater part of the fore-wing with coppery.

Length of fore-wing, ♂ 20 mm.; ♀ 19 mm.

Between Phari and Gyangtse, 13,000–15,000 ft., June 1904 (*H. T. Walton*), 3 ♂, 1 ♀.

Types ♂♀ in B.M.

The genitalia of this species give ample proof of its specific difference from the others placed in *Argestina*. It is the only one of the four completely to lack the area of modified scales on the fore-wing of the ♂, but, as to the rest of its generic characters, agrees exactly with *waltoni* and *karta*.

25. *Paroeneis sikkimensis* Staud.

1 ♂, Tinki, 13,500 ft., 15/7/22 (*N.*).

26. *Lycaena arene* Fawcett.

1 ♂, Dzaka Chu, 14,000 ft., 6/7/22 (*N.*).

1 ♂, Dzaka Chu, 14,000 ft., 7/7/22 (*N.*).

1 ♂, Tinki, 13,500 ft., 15/7/22 (*N.*).

28. *Lycaena pheretes pharis* Fawcett.

2 ♂, near Phari, 15,000 ft., 19/7/22 (*N.*).

29. *Lycaena asiatica* Elwes.

1 ♂, 1 ♀, Karma Valley, 12,000 ft., 21/6/22 (*N.*).

2 ♂, Karma Valley, 12,000 ft., 22/6/22 (*N.*).

2 ♂, Sakithung, 12,000 ft., 22/6/22 (*N.*).

30. *Lycaena janigena* Riley.

1 ♀, above Phari, 15,000 ft., 19/7/22 (*N.*).

30a. *Lycaena younghusbandi* Elwes.

1907. *Lycaena younghusbandi* Bing, *l.c.*, ii, p. 338.

1910. *Lycaena younghusbandi* Swinhoe, in Moore, viii, p. 5.

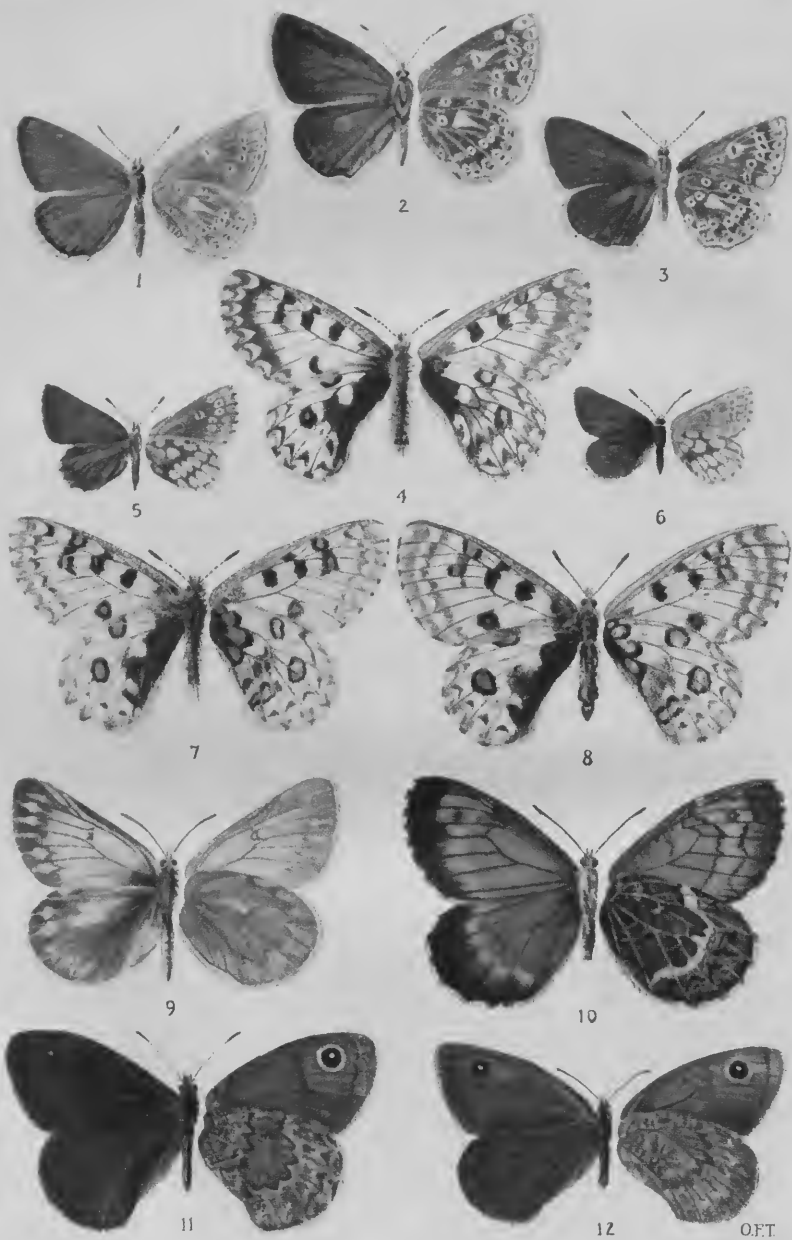
1912. *Lycaena younghusbandi* Evans, *List, l.c.*, p. 983.

1 ♂, Dzaka Chu, 14,000 ft., 7/7/22 (*N.*).

31. *Heodes phlaeas* L.

2 ♀, Arun Valley, 11,000 ft., 9/6/22 (*N.*).

1 ♂, 1 ♀, Kharta, 12,000 ft., 12/6/22 (*N.*).



O. F. Tassart, del.

Vaus & Crampton.



1



4



2



5



3



6



7



8

H. G. Herring, photo.

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BUTTERFLIES OF EVEREST EXPEDITION.

EXPLANATION OF PLATE XXXVI.

Rhopalocera of the Mt. Everest Expedition.

- FIG. 1♂. *Polyommatus everesti* Riley.
 2-3♀♀. " " Riley.
 4♂. *Lycaena janigena* Riley. (Type).
 5♀. " " Riley. (Type).
 6♂. *Parnassius epaphus himalayanus* Riley. (Type).
 7♂. " " *everesti* Riley. (Type).
 8♀. " " " Riley. (Type).
 9♂. *Colias cocandica tibetara* Riley. (Type).
 10♂. *Paroeneis grandis* Riley. (Type).
 11♂. *Argestina karta* Riley. (Type).
 12♀. " " Riley. (Type).

EXPLANATION OF PLATE XXXVII.

Rhopalocera of the Mt. Everest Expedition.

- FIG. 1♂. *Colias dubia* Elwes. (Type).
 2♀. " " E. of Deva La, 16,000 ft. 27?7?21.
 3♀. " *miranda* (*C. dubia* Elwes ♀ Type).
 4♂. " " Frühst. (Type), Adams Coll. (B.M.).
 5♀. " " " (Type), Adams Coll. (B.M.).
 6♂. *Argestina nitida* Riley. Underside.
 7♂. " " Riley. (Type).
 8♀. " " Riley.

*A Revision of the Malayan and Indian Species of the Melyrid
Subfamily Carphurinae represented in the Hope Collection at
Oxford and in the British Museum in London [Coleoptera].*
By G. C. CHAMPION, F.Z.S.

[Plate I.]

THE present paper is a result of a prolonged study of the numerous Carphurinae captured long ago by Wallace in New Guinea, the Moluccas, or the Malayan Archipelago, and of various collections made in later years by Doherty*, C. F. Baker†, G. E. Bryant, G. Lewis, H. E. Andrewes, and others in the same regions, or in Japan, Ceylon, or continental India. Nearly seventy species are represented in the material examined, five only of which had been identified up to the present time. Upwards of 200 members of the

* This excellent American collector, who died in hospital at Nairobi, E. Africa, on May 25th, 1893, visited the various Malayan Islands, &c., mentioned here between 1887 and 1893: see Hartert, Nov. Zool. 1901, pp. 494-504.

† Since this paper has been in type Mr. Baker has communicated some additional material from the Philippines &c. The study of the new forms sent must be deferred for the present.

group have been described, three-fourths of which are Australian. The only author who has paid any serious attention to them is Mr. A. M. Lea, of the Adelaide Museum, and his studies were restricted to the Australian fauna. He was the first to call attention to the ♂ tarsal comb (see text-figs. 1, 2, 4), a character overlooked by all other writers on these insects. The Carphurinae should be removed from the "Malachiides" of Lacordaire and treated as a separate subfamily of the Melyridæ, characterized by the more or less abbreviated elytra in the two sexes, leaving a considerable portion of the abdomen exposed; the lobed tarsal joints 2-4, 3 and 4, or 4 (4 dilated and appearing bilobed as seen from above in *Carphurus*, and quite small in *Carphuroides*), the first joint of the anterior pair always with a black comb beneath in the ♂; the presence of extensible vesicles at the sides of the prothorax and abdomen; and the simple structure of the terminal abdominal segments in the ♂. Three or four species only amongst the Malayan insects examined exhibit any marked cephalic structure in the ♂. The small narrow black forms are very like Telephorids of the genera *Malthodes*, &c. *Carphuroides* is also represented by single species in Rhodesia, Tropical America, and the Hawaiian Islands, but its real home must be in the Indo-Malayan region.

Dr. Waterston has been kind enough to dissect for me the genitalia of both sexes of *Carphurus basalis*, a ♂ of *C. pengaronæ*, and a ♂ of *Carphuroides dentiger*. The excellent preparations made by him, and drawn by M. Terzi, are shown on text-figures 1-4. The explanation of the ♂ and ♀ structures of *C. basalis* is given on Dr. Waterston's authority. So far as I am aware, the ♂-armature of a *Carphurus* has not hitherto been described or figured, and it proves to be different from that of any of the Telephorids known to me. The intromittent organ is simple in structure, but the long eversible tube in which it is contained is armed with sharp projecting teeth, these latter varying in position according to the species. Lea, in 1919, could only find the penis-sheath.

CHORESINE.

Choresine, Pascoe, Journ. Ent. i. p. 49 (April, 1860).

Choresine, type *C. advena*, ♂, based upon a single species from Batehian, was referred to the Cleridæ by Pascoe. The ♀ of that insect is now described and four others added, all captured by Wallace in the Moluccas or in New Guinea.

The presence of a tarsal comb in the ♂, and the extensible vesicles of the prothorax and abdomen, bring this genus near *Carphurus*, from which it is separable by the abruptly constricted prothorax, the narrow basal portion of the latter being somewhat produced, transversely sulcate or deeply excavate, and received into the hollowed base of the elytra. The inflation of the elytra in the fully-developed ♂ of *C. advena* is homologous with that of certain species of the S. American Melyrid-genus *Chalchas*, Blanch.; but this peculiarity is wanting in the ♀ of the same species, and in the new forms here noticed. Two of them are wholly metallic above; the others (including *C. advena*) have the head and prothorax testaceous and the elytra cyaneous. All have rather stout filiform antennæ, and one (*C. bicolorata*) has an elongated basal joint to the anterior tarsi in the ♂, as in *Carphurus rouyeri*, Pic. The tarsal joints 2-4 or 3 and 4 are excavate and widened, appearing bilobed as seen from above, as in *Carphurus* and *Balanophorus*.

1. *Choresine advena*. (Pl. I. figs. 1, 1 a, ♂ ; 2, ♀.)

♂. *Choresine advena*, Pasc. Journ. Ent. i. p. 49, t. 2, fig. 2 (1860).

♂. Elytra usually greatly inflated, emarginate at the base for the reception of the narrow basal portion of the prothorax, the humeri thus appearing to extend forwards; anterior tarsal joint 1 rather narrow, about as long as 2, nigro-pectinate in its outer half beneath (fig. 1 a); terminal dorsal segment of abdomen broadly arcuate-emarginate at tip.

♀. Elytra less inflated, feebly emarginate at base, the humeri not so prominent in front; anterior tarsal joint 1 without comb.

Hab. MOLUCCAS &c., Batchian [type], Mysol, Waigiou, Gilolo (*Wallace, in Mus. Brit. and Mus. Oxon.*).

Eight specimens of this species are before me, including the type (♂). It is easily recognizable by the broad, laterally rounded, greatly inflated, cyaneous elytra (leaving three or four abdominal segments exposed*) of the ♂, the testaceous head, antennæ, prothorax, and legs, and the black metasternum; the long, stout, filiform antennæ; and the abruptly constricted, deeply transversely sulcate base of the prothorax. The head and antennæ are similarly formed in the two sexes. The four hinder tibiæ are furnished with long blackish hairs, and the tarsal joints 3 and 4 are sometimes infusate.

* One only is shown in Pascoe's bad figure.

2. *Choresine bicolorata*, sp. n. (Pl. I. figs. 3, 3 a, ♂.)

♂. Elongate, rather broad, shining, pubescent; testaceous; the eyes, metasternum, and penultimate tarsal joints black or picceous, the scutellum and elytra violaceous; the head and prothorax minutely, the elytra densely, rugulose punctured. Head (with the eyes) about as broad as the prothorax; antennæ long, stout, filiform. Prothorax as long as broad, abruptly constricted and narrowed posteriorly; very deeply transversely sulcate before the base and also on each side anteriorly. Elytra much wider than, and nearly three times the length of, the prothorax, leaving four abdominal segments exposed, subparallel, rounded at the sides anteriorly, flattened on the disc. Legs stout, finely pubescent; anterior tarsal joint 1 thickened, as long as 2-4 united, nigro-pectinate along the entire lower edge (fig. 3 a). Terminal dorsal segment of abdomen arcuate at tip.

♀. Anterior tarsi without comb; elytra a little broader. Length 5-5½ mm.

Hab. NEW GUINEA, Dorey [♀], and Waigiu [type ♂] (Wallace, in *Mus. Oxon.*).

One pair. A close ally of *C. advena*, Pasc., with flattened subparallel elytra and a long basal joint to the anterior tarsi (which is nigro-pectinate along the entire lower edge in ♂), the four hinder tibiæ without longer hairs.

3. *Choresine buruensis*, sp. n.

♀. Very elongate, shining, clothed with fine pubescence intermixed with longer shaggy hairs, the tibiæ also hairy; the head (the eyes excepted), the antennal joints 1-6 in great part, prothorax, abdomen, and femora testaceous, the metasternum and the rest of the antennæ and legs black or picceous, the elytra fusco-violaceous; the head finely, the prothorax very sparsely, and the elytra densely, rugulose punctured. Head not wider than the prothorax, rather small, feebly bi-impressed between the eyes; antennæ long, stout, thickening outwards, the joints subcylindrical, 6-11 gradually increasing in length, all longer than broad. Prothorax convex, narrow, rounded at the sides and abruptly constricted before the base, the narrow basal portion produced, truncate and raised behind, and deeply transversely excavate, the disc also transversely sulcate anteriorly. Elytra rather convex, rounded at the sides and tip (as seen from above), at the middle about three times the width of the prothorax, leaving five segments exposed. Anterior

tarsal joint 1 small, without comb. Intermediate and posterior tibiae thickened and slightly curved.

Length $4\frac{1}{2}$ mm.

Hab. MOLUCCAS, Buru (*Wallace, in Mus. Oxon.*).

One ♀. Much smaller than the same sex of *C. advena*, Pase., the prothorax narrower and more convex, the elytra less inflated, the antennae in part, and the tibiae and tarsi, black, the tarsi less dilated.

4. *Choresine moluccana*, sp. n. (Pl. I. fig. 4, ♀.)

♀. Moderately elongate, rather broad, shining, pubescent; nigro-cyaneous, the mouth-parts and basal joints of the antennae pale testaceous, the rest of the latter nigro-piceous; the head and prothorax closely punctured, the latter smoother on the disc and rugose at the sides, the elytra finely, rugulose punctate. Head as broad as the prothorax, foveate in the middle between the eyes; antennae very long, stout, filiform, thickening outward, joints 4–11 much longer than broad. Prothorax convex, a little longer than broad, abruptly constricted and narrowed before the base, the transverse basal excavation very deep. Elytra broad, about twice the length of, and at the base not much wider than, the prothorax, leaving four abdominal segments exposed, rounded at the sides and apex. Legs short; anterior tarsal joint 1 short, without comb.

Length $3\frac{1}{4}$ mm.

Hab. MOLUCCAS, Batchian (*Wallace, in Mus. Oxon.*).

One example. Distinguishable by its short form, small size, and cyaneous coloration; the antennae stout and very elongate, pale at the base; the thorax unimpressed anteriorly, the basal excavation deep; the elytra broadly oboval, comparatively short.

5. *Choresine nigroviolacea*, sp. n.

♂. Very elongate, shining, the elytra duller, finely pubescent; nigro-violaceous, the prothorax purplish on the disc, the antennae (the testaceous lower surface of joints 1–5 excepted) black; the head and prothorax closely, finely punctate, the latter smoother on the disc and rugulose at the sides, the elytra densely, rugulose punctured. Head about as wide as the prothorax, strongly, obliquely bi-impressed between the eyes; antennae very elongate, rather slender, subfiliform, joints 7–11 much longer than those preceding. Prothorax convex, not longer than broad,

somewhat rounded at the sides, angularly, abruptly constricted before the base, the short basal portion narrow; with a very deep transverse excavation before the base and also transversely sulcate anteriorly. Elytra somewhat flattened, a little widened posteriorly, rounded at the tip, leaving four segments exposed. Anterior tarsal joint 1 nearly as long as 2-4 united, nigro-pectinate along the lower edge.

Length 6 mm.

Hab. NEW GUINEA (*Wallace, in Mus. Oxon.*).

One specimen, ♂, exact locality not recorded. A large metallic form, with very long, subfiliform antennæ, a strongly constricted, basally-excavate prothorax, and long, densely rugulose elytra. The basal constriction of the prothorax is stronger than in *C. advena*, *Pase.*

NEOCARPHURUS.

Neocarpurus, Lea, Proc. Linn. Soc. N.S.W. 1898, p. 580; Trans. Ent. Soc. Lond. 1909, p. 211, pl. 2, fig. 6.

The nine species of this genus described by Lea are all Australian, some of them being confined to Queensland. Two small forms found in Ceram and Timor respectively are here referred to it. They differ from *Carphurus* in having the prothorax constricted into a narrow neck behind, and deeply excavate before the base, the basal margin thus appearing raised; but the constriction is less abrupt than in *Choresine*.

1. *Neocarpurus annulipes*, sp. n. (Pl. I. figs. 5, 5 a, ♂.)

♂. Elongate, narrow, shining, the elytra opaque, finely pubescent; nigro-piceous, the anterior portion of the head, the antennal joints 1-8, the basal margin of the prothorax, a transverse fascia on the elytra below the base (not reaching the suture), the coxæ in great part, the bases of the femora, and a spot near the apices of the anterior and intermediate pairs, and the apices of the tarsi, testaceous or flavous. Head wider than the prothorax, bisulcate in front, and with a transverse, mesially foveate, V-shaped groove between the eyes above; antennæ very elongate, slender, filiform. Prothorax very convex, elongato-cordate, strongly constricted posteriorly, the basal portion narrow, transversely sulcate; the surface obliquely, longitudinally strigose laterally and smooth along the middle, the gibbous portion of the disc bordered on each side by a narrow, sharply-defined, longitudinal groove (fig. 5 a). Elytra about as long as the head

and prothorax, not wider than the head, oblongo-quadrate, parallel, flattened on the disc, sinuate at the base, the humeri angular in front and obliquely carinate; the surface-sculpture extremely fine, the apices truncate, leaving four segments exposed. Tarsal joints 3 and 4 slightly widened and produced, 1 of anterior pair feebly curved, as long as the others united, narrowly nigro-pectinate along the entire lower edge.

Length $2\frac{1}{4}$ mm.

Hab. MOLUCCAS, Ceram (*Wallace, in Mus. Oxon.*).

One ♂. The basally excavate, posteriorly constricted prothorax of this insect gives it the general facies of a *Troglops*; but the tarsal structure agrees with that of *Carphurus*. The flavous markings on the femora are conspicuous and almost transparent. *N. annulipes* is not unlike *N. angustibasis*, Lea (1921), from Queensland, specimens of which have been presented to the British Museum by the author.

2. *Neocarphurus stenoderus*, sp. n.

♂. Elongate, narrow, shining, finely pubescent, with longer hairs intermixed; piceous, the head and prothorax fusco-testaceous, the antennal joints 1–3 and legs testaceous or obscure testaceous, the rest of the antennae and the eyes black; the entire upper surface densely, rugulose punctulate, the prothorax rougher at the sides anteriorly. Head very broad, deeply foveate in the middle between the eyes, the latter large and convex; antennae extremely elongate, nearly as long as the body, subfiliform, joint 2 short, 3 a little longer than 2, 4–11 elongate, gradually increasing in length. Prothorax narrow, compressed, longer than broad, constricted and transversely excavate before the base. Elytra much wider than the prothorax, depressed, parallel, long, subtruncate at the tip, leaving three abdominal segments exposed, a little widened posteriorly. Legs elongate, slender; anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate along the lower edge.

Length 3 mm.

Hab. TIMOR, Mt. Lco, alt. 2000–4000 feet (*Doherty*).

One male. More elongate than *N. annulipes*, ♂, the antennae extremely elongate; the head very broad, and with prominent large eyes; the prothorax narrow, laterally compressed, and less rounded at the sides; the elytra much more elongate; the entire surface rugulose; the legs more elongate. The unusually long elytra and broad head give this species a facies different from that of *Carphurus*; but

the presence of a tarsal comb shows that it belongs to the same group.

Microcarphurus brunneiventris, Pic (1917), type ♀, from Aru, diagnosed in ten words, may be an allied form?

BRACHYHEDYBIUS.

Brachyhedybius, Pic, *Mélanges exot.-entom.* xxv. p. 10 (1917).

This genus, if correctly identified here, is based upon the ♂ of a New Guinea insect found in numbers by Wallace. It is closely related to *Carphurus*, Er., from which it differs in having the elytra shorter, laterally dilated, and sinuate and dehiscent at the apex, thus resembling an *Ichthyurus*. The ♀ has differently coloured, undilated elytra. The generic name is inappropriate, *B. sinuatus* bearing no resemblance to any *Hedybius* known to me.

1. *Brachyhedybius sinuatus*. (Pl. I. figs. 6, 6 a, ♂.)

♂. *Brachyhedybius sinuatus*, Pic, *Mélanges exot.-entom.* xxv. p. 10 (1917).

♂. Very elongate, robust, shining, finely pubescent, the head, prothorax, femora, tibiae, and abdomen with long erect or projecting hairs; testaceous, the eyes, the antennae to a variable extent (the basal joints beneath and the outer joints within excepted), and abdomen black, the elytra flavous, the apical margin slightly infuscate in one specimen. Head long, large, obliquely narrowed behind, finely punctured, transversely strigose at the base, deeply 5-foveate between the eyes, the three upper foveae confluent and together forming a transverse sulcus, the other two limited externally by a short curved ridge and separated from the rest by three transversely-placed pilose tubercles (fig. 6 a); eyes very large, prominent; antennae long, broad, strongly obliquely serrate. Prothorax oblong-subcordate, deeply transversely excavate on each side before the base and apex; sparsely, finely punctate. Elytra soft, short, about one-half longer and much broader than the prothorax (leaving six abdominal segments exposed), rounded and explanate at the sides, the margins reflexed, the humeri prominent, the apices oblique, sinuate, and dehiscent, and each with an indication of a tumid spot; closely, finely punctured. Abdomen very long. Anterior tarsal joint 1 short, nigro-pectinate along the lower edge.

♀. Head flattened and shallowly trifoveate between the eyes, the latter less prominent; antennae shorter and less dilated; elytra black, except at the base, subparallel, the

margins not explanate, the apices more rounded; anterior tarsi without comb.

Length 8-10 mm. (♂ ♀.)

Hab. NEW GUINEA [*type of Pic*, ♂], Dorey, Mysol, and Waigiu (Wallace, *Mus. Brit. and Mus. Oxon.*: ♂ ♀).

Fourteen specimens seen, including four males, the latter agreeing with Pic's incomplete description, in which the antennal and tarsal structure is ignored. Both sexes were obtained in Mysol and New Guinea by Wallace, and there can be no doubt that they belong to the same species; the ♀ is extremely like the same sex of *Carphurus* (*Balanophorus*) *apicalis*, Pic (nee Macleay), also from New Guinea, except that it has shorter and more deliscent elytra. *Balanophorus macassarensis*, Pic, type ♀, also has short elytra; but as the antennæ are described as "subflabellate," the Macassar insect cannot be the ♀ of the present species. An immature ♀ of *B. sinuatus* from Mysol has the disc of the prothorax strigose. The cephalic structure of the ♂ is very like that of *Carphurus laratensis*, infra.

CARPURUS.

Carphurus, Erichson, *Entomographien*, p. 132 (1840) (type, *C. dispar*, ♂); Lea, *Trans. Ent. Soc. Lond.* 1909, p. 186, and *Trans. Roy. Soc. S. Australia*, xlv. p. 94 (1921).

Helcogaster, Boheman, *Eugen. resa*, p. 81 (1858) (type, *H. brachypterus*, ♀); Lea, *loc. cit.* p. 213, and *loc. cit.* p. 107.

This genus includes a very large number of species, and has its headquarters in Australia*, extending in a north-westerly direction through New Guinea, the Moluccas, the Philippines, and the Malayan Archipelago to India, two or three small forms reaching the Himalaya. *Helcogaster*, based on ♀ ♀ only, is accepted by Lea, who relies upon the excavate, tubereulate head of the ♂ ♂ to distinguish it from *Carphurus*. Excluding a few species here placed under the generic name *Carphuroides*, fifty eastern forms are represented in the collections examined, and about twenty others from the same regions have been named by Motschulsky, Bourgeois, or Pic. *Balanophorus*, McLeay, the species of which (according to a recent paper by Lea, *Trans. Roy. Soc. S. Austr.* xlv. p. 94, 1921) have a tarsal comb in both sexes, and flabellate antennæ in ♂, I have not seen from outside Australia.

The following key should assist in the identification of the

* *C. venustus*, Kirsch (1877), has probably been introduced into the Auckland Isls. It is not known from New Zealand.

species here enumerated; but as ♀ ♀ only are represented in eleven of them, it cannot be based on the ♂-characters alone :—

- 1 (20). Antennal joint 1 of ♂ normal.
- 2 (19). Anterior tarsal joint 1 of ♂ shorter, equalling 2 and 3 or 2-4 united.
- 3 (16). Antennæ dentate, serrate, or subserrate, flabellate in No. 12, in ♂.
- 4 (5). Prothorax transversely strigose, subquadrate; head foveate or tuberculate in Nos. 1, 2, ♂ .. Species 1-6.
- 5 (4). Prothorax simply punctured or almost smooth.
- 6 (7). Body wholly metallic above; head small in ♂. Species 7.
- 7 (6). Body not or partly metallic above; elytra dentate or angulate at sides below the humeri in Nos. 8, 17, 18, ♂.
- 8 (9). Body uniformly testaceous; head bicarinate and foveate in No. 8, ♂ Species 8-10.
- 9 (8). Body not uniformly testaceous.
- 10 (11). Head entirely or in part and prothorax (except in No. 12 and No. 18, var.) testaceous; elytra metallic in No. 11, vittate in No. 16; abdomen variously coloured; head foveate, plicate, or fasciculate in Nos. 17, 18, ♂ Species 11-21.
- 11 (10). Head (except in front in Nos. 22, 23) and prothorax infusate.
- 12 (13). Prothorax and elytra more or less metallic; abdomen (except in vars.) wholly or in part testaceous; elytra sometimes with a testaceous lateral stripe; antennæ short, serrate. Species 22, 23.
- 13 (12). Prothorax and elytra not or faintly metallic.
- 14 (15). Body black; the elytra usually with a large whitish or testaceous space on the disc or at the sides in No. 24, and the base abruptly testaceous in No. 25 Species 24, 25.
- 15 (14). Body black or piceous, the abdomen sometimes in part rufescent in No. 26, the head reddish in front in No. 30; species moderate in size, or small and resembling *Malthodes* (Nos. 31-33). Species 26-33.
- 16 (3). Antennæ more feebly serrate or subfiliform.
- 17 (18). Body testaceous (No. 34), the elytra black in No. 35 Species 34, 35.
- 18 (17). Body black or piceous, the head and prothorax testaceous or rufo-testaceous in Nos. 36, 37, the legs yellow in No. 38, the abdomen in part or wholly testaceous in Nos. 42 and 44, var.; upper surface rough in No. 39.... Species 36-45.
- 19 (2). Anterior tarsal joint 1 of ♂ elongate, as long as 2-5 united; antennæ very elongate and serrate in ♂, much shorter and subfiliform in ♀; head, and sometimes the prothorax also, rufescent; elytra usually with a transparent streak or fascia: species small, narrow. Species 46-48.
- 20 (1). Antennal joint 1 of ♂ greatly thickened, the other joints filiform: species black and shining. Species 49, 50.

1. *Carphurus plicaticollis*.

Carphurus plicaticollis and vars. *curdaiensis*, *notaticollis*, and *rufithorax*, Pic, Mélanges exot.-entom. xxvii. p. 7 (1918).

♂. Eyes extremely large, oval; antennae dilated, moderately long, sharply serrate; head with two or four transversely placed foveae between the eyes and longitudinally bisulate in front of this; anterior tarsal joint 1 small, nigro-pectinate beneath.

♀. Antennae usually a little less dilated; head flattened between the eyes.

Length $4\frac{3}{5}$ –7 mm. (♂ ♀.)

Hab. NEW GUINEA (types of Pic; Sayer, 1887, ex coll. Sharp), Dorey, and Waigiou (Wallace); MOLUCCAS &c., Batehian, Gilolo [Halmaheira], Tenimber, Ké Is. (Wallace, Doherty).

There are numerous examples of this variable insect in the Hope Museum at Oxford and the British Museum in London, nearly all captured by Wallace or Doherty, including five ♂♂ and one ♀ of the var. *rufithorax*, Pic. It usually has the head, and the prothorax in some specimens, red, the elytra black, sometimes with a faint violaceous tint, and the abdomen wholly or in part black. The prothorax is oblong-subquadrate and transversely plicate, and the elytra are closely, rugulose punctured. The Australian *C. vigilans* and *C. strigicollis*, Lea, have a similarly sculptured prothorax.

2. *Carphurus rastratus*, sp. n. (Pl. I. fig. 8, ♂.)

? *Carphurus cyaneipennis*, MacI. Proc. Linn. Soc. N.S.W. (2) i. p. 153 (1886) (nec *C. cyaneipennis*, MacI. Trans. Ent. Soc. N.S.W. ii. p. 263, 1872).

♂. Elongate, rather dull, finely pubescent, the legs hairy; rufo-testaceous, the antennae (except at the base and tip), eyes, under surface, and legs (the testaceous knees, tarsi, and apices of the tibiae excepted) black, the elytra cyaneous or fusco-cyaneous, the abdomen testaceous; the head and elytra densely, rugulose, the abdomen feebly punctured, the prothorax closely, transversely strigose. Head very large, as seen from above with an irregular X-shaped elevation between the eyes, followed by two deep confluent central foveae and preceded by an angular, bi-impressed excavation; eyes extremely large; antennae moderately long, stout, sharply serrate. Prothorax as long as broad, subquadrate, without definite excavations. Elytra widened posteriorly, about as

long as the five exposed segments, rounded at the tip. Anterior tarsal joint 1 small, nigro-pectinate beneath.

♀. Head without foveæ, the eyes smaller; antennæ less dilated; abdomen black at the tip.

Length $5\frac{1}{2}$ –6 mm.

Hab. MOLUCCAS, Banda [♂, type] and Ceram [♀] (*Wallace, in Mus. Oxon.*); NEW GUINEA (*Sayer, ex coll. Sharp: ♀*).

One ♂, two ♀ ♀, the latter apparently belonging to the same species. This is a close ally of *C. plicatocollis*, Pic, differing from it in the metallic elytra and the structure of the head in the ♂, the latter (as seen from behind) having a deep central transverse fovea behind the frontal excavations. *C. cyaneipennis*, Mael. (1886), from New Guinea, may have been based upon the present species, and *C. rubriventris*, Motsch., "Ind. or," seems to be an allied form.

3. *Carphurus celebensis*, sp. n.

♀. Very elongate, shining, pubescent, with longer hairs intermixed; black, the head and prothorax with a greenish lustre, the anterior margin of head and a small spot between the eyes, palpi, the five basal joints of antennæ in great part, anterior tarsi, and the abdominal segments 4–6 (except 4 at base) testaceous or rufo-testaceous, the elytra violaceous; the head and elytra closely punctured, the prothorax transversely strigose on the disc and rugose at the sides. Head about as wide as the prothorax; antennæ rather slender, sharply serrate. Prothorax transverse, subquadrate, transversely grooved before the base. Elytra elongate, subparallel, leaving five segments exposed. Anterior tarsal joint 1 small, without comb.

Length 6 mm.

Hab. CELEBES, Tondano (*Wallace, in Mus. Oxon.*).

One ♀. A form of *C. ruficeps*, Pic, with a smoother blackish head, a less rugose prothorax, and slightly longer, parallel-sided, rougher elytra. *C. rufonotaticeps*, Pic (1917), from the same island, wants the transverse plication of the prothorax and has the prothorax itself elongate.

4. *Carphurus wallacei*, sp. n.

♀. Very elongate, moderately shining, pubescent, with longer hairs intermixed; head, antennal joints 1 and 2, palpi, prothorax, abdomen in great part, and anterior legs (the femora and coxæ in part excepted) testaceous, the rest of the antennæ, legs, and under surface black, the elytra

cyaneous; the head and prothorax elosely, finely, the elytra rather strongly and rugosely, punctured, the prothorax finely transversely strigose on the disc. Head about as wide as the prothorax, bi-impressed anteriorly, the eyes rather large; antennæ moderately long, serrate. Prothorax strongly transverse, narrowed posteriorly. Elytra much broader than the prothorax, widened posteriorly, leaving five segments exposed. Anterior tarsal joint 1 small, about as long as 2 and 3 united, without comb.

Length $5\frac{1}{4}$ mm.

Hab. NEW GUINEA (*Wallace, in Mus. Oxon.*).

One ♀, exact locality not recorded.

A close ally of *C. rastratus* (?=*cyaneipennis*, Mael., 1886), with a small, strongly transverse prothorax, more rugose, hairy elytra, and much smaller eyes.

5. *Carphurus ruficeps*.

Carphurus ruficeps, Pic, L'Echange, xxii. p. 57 (1906).

♂. Antennæ stout, moderately long, serrate; head large, transversely grooved between the eyes, the latter very large; anterior tarsal joint 1 about as long as 2 and 3 united, nigropectinate beneath.

♀. Antennæ less dilated; eyes a little smaller, the transverse groove between them shallow or obsolete.

Var. Head (except at the base) rufous; the prothorax nigro-cyaneous, the elytra violaceous or fusco-violaceous, and often semitransparent; the abdomen testaceous, with the basal segments and the terminal one violaceous or black, rarely almost entirely testaceous; antennæ (except at the base) and legs (the knees and tarsi in part excepted) black; the elytra a little longer, subparallel, broader and less rounded at the tip, and densely, rugulosely punctured.

Length $4\frac{1}{2}$ – $6\frac{1}{2}$ mm. (♂ ♀.)

Hab. MOLUCCAS &c., Amboyna [*type of Pic*], Ceram, Bat-chian, Buru, Timor, Morty, Sula (*Wallace and Doherty, in Mus. Brit. and Mus. Oxon.*).

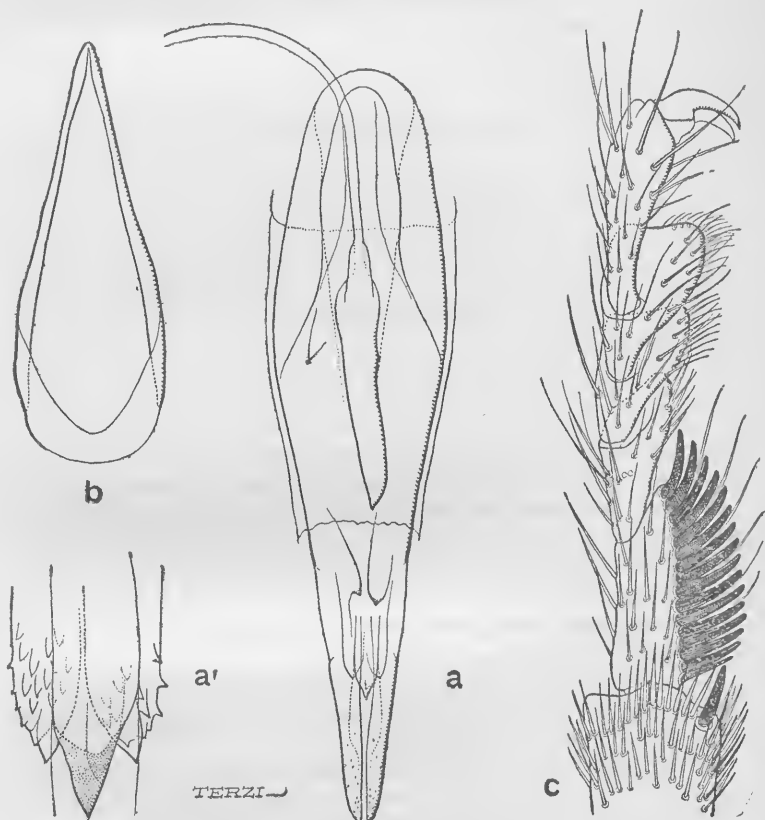
The typical form of this species has a red, rugosely punctured head, a transversely subquadrate, plicate, metallic prothorax, and very finely punctured, whitish elytra (a triangular dark scutellar patch excepted), the abdomen in great part testaceous, and the legs (the anterior tarsi excepted) black. Of this form there are several examples before me from Amboyna and Ceram, including a pair captured by Doherty. The eight specimens seen from the other islands are all ♀ ♀, and they must be treated as a variety of

C. ruficeps for the present. These latter can be separated from the variable *C. plicaticollis*, Pic, by the subquadrate, shorter prothorax, the relatively smaller eyes, and the different structure of the head in the ♂.

6. *Carphurus pengaronæ*, sp. n.

♂. Moderately elongate, widened posteriorly, shining, somewhat thickly pubescent, with longer hairs intermixed;

Fig. 1.



Carphurus pengaronæ, ♂ : *a*, *a'*, genitalia ; *b*, spiculum ? ;
c, anterior tarsus and apex of tibia.

black with a bluish lustre in certain lights, the antennal joints 1 and 2, palpi, and abdominal segments 5 and 6 testaceous or rufescent ; the head closely, finely, the sides of

the prothorax and the elytra densely rugulosely, punctured, the prothorax transversely strigose on the disc. Head about as wide as the prothorax, feebly foveate in the centre between the eyes, the latter moderately large; antennae long, broad, strongly serrate. Prothorax transverse, subquadrate. Elytra moderately long, much wider than the prothorax, widening to the apex, the latter rounded, leaving four or five segments exposed. Anterior tibiae with a single black dentiform seta at the apex beneath; anterior tarsal joint 1 rather stout, nearly as long as joints 2-4 united, nigropectinate along the lower edge, the comb furnished with 16 teeth (text-fig. 1, c).

♀. Antennae shorter and less dilated.

Length 4-4 $\frac{1}{4}$ mm. (♂ ♀.)

Hab. BORNEO, Pengaron (*Doherty*: ♂ ♀); GT. SANGUIR, Taruna (*Doherty*: ♀).

Eight ♂♂ and three ♀♀ from Pengaron, one ♀ from Taruna. A dark form of *C. sumatrensis*, Pic, which was also found in the same locality by Doherty, with a less rugose head, longer, broader, and stouter antennae in ♂, a transversely strigose, laterally rugose prothorax, and densely, more finely punctured elytra. The genitalia and tarsal comb of ♂ are shown on text-fig. 1, a-c.

7. *Carphurus sayeri*, sp. n.

♂. Very elongate, robust, shining, clothed with fine scattered pubescence intermixed with numerous long, erect, blackish hairs, the femora and tibiae also hairy; brilliant nigro-eyaneous, the elytra violaceous, the antennae (the testaceous lower surfaces of the basal joints excepted) and legs black; the head and prothorax almost smooth, the elytra closely punctured. Head short, narrower than the prothorax, transversely depressed between the eyes, the latter rather small; antennae moderately elongate, comparatively stout, joints 6-11 much longer than those preceding, 6-10 elongate-triangular. Prothorax nearly as long as broad, moderately convex, transversely grooved before the base. Elytra broader than, and nearly three times the length of, the prothorax, widening posteriorly, broadly depressed along the suture below the base, rounded at the apex, leaving about four segments exposed. Anterior tarsal joint 1 as long as 2 and 3 united, rather stout, furnished with a row of long black teeth along the lower edge.

Length 4 $\frac{1}{2}$ mm.

Hab. NEW GUINEA (*Sayer Expedition, ex coll. Sharp*).

One ♂. A brilliantly metallic, robust, nigro-hirsute insect, with a comparatively small, short head and a polished basally-excavate prothorax. An isolated form, with the general facies of a Galerucid.

8. *Carphurus laratensis*, sp. n. (Pl. I. figs. 7, 7 a, ♂.)

♂. Very elongate, robust, shining, sparsely pubescent and also clothed with long, erect or projecting, darker bristly hairs; testaceous, or reddish testaceous, the eyes excepted; the basal portion of the head closely, the elytra coarsely, rugosely, and the prothorax and abdomen very sparsely, finely, punctured. Head about as wide as the prothorax, hollowed and bibeate in the middle between the eyes, and with four large, deep, transversely placed foveæ extending across the depressed postocular space; eyes moderately large. Antennæ stout, long, serrate. Prothorax longer than broad, bi-impressed laterally. Elytra wider than the prothorax, long, flattened on the disc, oblongo-quadrate, truncate at the tip, leaving five abdominal segments exposed; the outer margins triangularly dilated below the humeri and hollowed at the middle. Anterior tarsal joint 1 short, nigro-pectinate along the entire lower edge.

♀. Head flattened, longitudinally bi-impressed between the eyes, sparsely punctured; elytral margins feebly sinuate.

Length 7-9 mm. (♂ ♀.)

Hab. LARAT (*F. Muir*: ♂ ♀); TENIMBER, Jandema (*Doherty*: ♂ ♀).

Six ♂♂, seven ♀♀, the specimens from the two islands agreeing perfectly *inter se*. A large, robust, testaceous form, with coarsely punctured, flattened, oblongo-quadrate elytra, and stout serrate antennæ in the two sexes; the ♂ with an excavate, bibeate, transversely 4-foveate head and the lower margin of the elytra angulate below the base. *C. laratensis* belongs to Lea's Group A (Revision, 1909); the ♂ elytra are shaped as in his *C. uncinatus*.

9. *Carphurus testaceicolor*.

♀. *Balanophorus testaceicolor*, Pic, Mélanges exot.-entom. xxv. p. 11 (1907)?

"Elongatus, nitidus, testaceus, oculis et antennis pro maiore parte nigris. Long. 9 mm." [*Pic.*]

♂. Very elongate, rather narrow, shining, sparsely pubescent, with longer hairs intermixed; testaceous, the eyes and the antennal joints 2-7 or 2-8 black; the head sparsely punctured, the elytra subcoriaceous and very finely

punctulate, the rest of the surface almost smooth. Head longitudinally bisulcate between the eyes, the latter extremely large; antennæ very elongate, stout, sharply serrate. Prothorax longer than broad, bi-impressed laterally. Elytra broader than the prothorax, as long as the five exposed abdominal segments, rounded at the tip. Anterior tarsal joint 1 as long as 2-4 united, nigro-pectinate along the entire lower edge.

♀. Head as in ♂, the eyes much smaller; antennæ equally elongate, but more slender, tapering towards the tip; anterior tarsi without comb.

Length $6\frac{1}{2}$ - $7\frac{1}{2}$ mm.

Hab. NEW GUINEA, Andai [type of *Pic*], and Mysol (Wallace: *Mus. Brit. and Mus. Oxon.*).

Two ♂♂ and three ♀♀ in the collections before me, including a ♀ from New Guinea, are perhaps referable to this species, which is diagnosed by the author in ten words and compared with his *B. apicalis*. These specimens have very elongate, serrate antennæ and extremely finely punctured elytra. The ♀ resembles the same sex of the Australian *C. longus*, Lea (a ♀ of which from Kuranda, Queensland, is before me); the latter, however, has slender antennæ, smaller eyes, and more strongly punctured elytra.

10. *Carphurus pallidulus*, sp. n.

♀. Elongate, narrow, shining, finely pubescent, with longer hairs intermixed; testaceous, the eyes, tips of mandibles, and antennæ (except at the base) black or piceous; the upper surface very sparsely, the elytra closely, minutely, punctured. Head much broader than the prothorax, bi-impressed in front, the eyes extremely large and convex; antennæ moderately long, rather slender, joint 2 about as long as 3, 4-10 triangular, 6-10 slightly longer than broad. Prothorax convex, narrow, as long as broad, deeply transversely depressed before the base and with an oblong sulciform excavation on each side anteriorly. Elytra much wider than the prothorax, comparatively short, depressed, dehiscent at the sutural angle, bluntly rounded at the apex, leaving six abdominal segments exposed. Anterior tarsi slender, joint 1 narrow, as long as 2 and 3 united.

Length 5 mm.

Hab. BATCHIAN, Labuan [Laboean] (*Doherty*).

One ♀, somewhat immature. Not unlike *C. batchianus* (No. 30) (found by Doherty in the same island), and with the head, eyes, and prothorax similarly shaped; the body

and legs wholly testaceous; the antennæ totally different in form; the elytra shorter, more rounded at the tip, and minutely, less rugulosely punctate. The two insects cannot possibly be the sexes of the same species. *C. (Balanophorus) testaceicolor*, Pic, from New Guinea and Mysol, is a much larger form, with very elongate, sharply serrate antennæ in both sexes.

11. *Carphurus fasciatifrons*, sp. n.

♀. Very elongate, robust, shining; the elytra and abdomen closely cinereo-pubescent, the head and prothorax sparsely pubescent and with longer scattered hairs intermixed, the legs and abdomen also with long erect or projecting hairs; the head (a transverse black inter-ocular fascia and a piceous spot in front of it, and the eyes excepted), palpi, basal joints of the antennæ beneath, prothorax, scutellum, anterior coxæ, and bases of all the femora, testaceous or flavous, the elytra obscure nigro-cæruleous, the abdomen, under surface, the rest of the antennæ, and the legs in part, nigro-piceous; the head and prothorax very sparsely, minutely, the elytra densely, rugulosely, and the abdomen closely and extremely finely, subrugulosely punctate. Head broad, the inter-ocular space slightly depressed and with a small tubercle in the middle, the eyes very large; antennæ long, serrate. Prothorax subeordate, about as broad as long, transversely depressed before the base and on each side anteriorly. Elytra $2\frac{1}{2}$ times the length of the prothorax, elongato-quadrate, flattened on the disc, widening posteriorly, and truncate at the tip, leaving five abdominal segments exposed. Anterior tarsal joint 1 nearly as long as 2-4 united, without comb.

Length 9 mm.

Hab. Mysol (*Wallace, in Mus. Oxon.*).

One ♀. A large, robust, elongate form, with a broad, nigro-fasciate head, a trifoveate, cordiform prothorax, long, parallel-sided, bluish-black, rugose elytra, rugulose abdomen, and a long basal joint to the anterior tarsi, these characters separating *C. fasciatifrons* from all the Malayan species known to me.

12. *Carphurus dohertyi*.

? *Balanophorus dohertyi*, Pic, *Mélanges exot.-entom.* xxv. p. 10 (♂) (1917).

♀. Elongate, shining, black, finely pubescent, with intermixed long, erect, black hairs, the legs also hairy; black,

the head (except at the base), antennæ (except at the base and apex), abdomen in great part, knees, and tarsi testaceous or rufo-testaceous. Head large, sparsely, very finely punctured, transversely strigose at the base, bi-impressed in front; eyes extremely large, oval; antennæ sharply dentate, stout. Prothorax about as long as broad, sparsely, coarsely punctate, transversely depressed before the base and on each side anteriorly. Elytra broader than the prothorax, widened posteriorly, rather elongate, bluntly rounded at the tip; closely, rugulose punctured. Anterior tarsal joint 1 short, without trace of comb.

Length $7\frac{1}{2}$ –8 mm.

Hab. MOLUCCAS &c., Obi (*Doherty*: type of *Pic*, ♂), Dodinga, Gilolo [Halmaheira] (*Doherty*: ♀).

A very large shining black form, with the head and abdomen in part red, not unlike *C. plicatocollis*, *Pic*, but with a sparsely punctured, non-plicate prothorax, the antennæ flabellate and the head sulcate in ♂. The two females from Gilolo must belong to the same species. If the genus *Balanophorus* is to be restricted to forms with a tarsal comb in both sexes, as has been adopted by Lea in 1921, the present species must be included under *Carphurus*.

13. *Carphurus dentaticornis*, n. n.

? *Balanophorus apicalis*, *Pic*, Mélanges exot.-entom. xxv. p. 11 (♀) (1917) (nec *C. apicalis*, *Macl.*, 1872).

“Elongatus, nitidus, pallido testaceus, oculis, antennis pro majore parte, tarsis abdomineque pro majore parte nigris, elytris nigris, ad basin testaceis; antennis crassis, dentatis. Long. 8 mm.” [*Pic*.]

Var. Elytra almost entirely and posterior tibiae infuscate or black, the abdomen (except at tip) testaceous.

Hab. NEW GUINEA, Andai [type of *Pic*], Dorey, and Waigiou (*Wallace*, in *Mus. Oxon.*); MOLUCCAS, Buru (*Doherty*).

Three ♀ ♀, length $7\frac{1}{2}$ –10 mm., found by Wallace and Doherty, are probably referable to the imperfectly-described *C. apicalis*, *Pic* (nec *Mael.*), which is said to differ from *C. (Balanophorus) macassarensis*, *Pic* (loc. cit.), type ♀, from Macassar, in having the abdomen red at the tip and the elytra longer. The specimens before me are very like *Brachyhedybius sinuatus*, *Pic*, ♀; but they have much larger eyes, sharply dentate antennæ, with the basal joints and tip testaceous, and more elongate, closely punctured elytra. *B. macassarensis* has subflabellate antennæ in ♀. The anterior tarsi are without comb. The variety is represented by a ♀ from Buru.

14. *Carphurus rubroannulatus*.

- Carphurus rubroannulatus*, Motsch. Etudes Ent. viii. p. 64 (1859)¹.
Carphurus variventris, Fairm. Ann. Soc. Ent. Fr. 1888, p. 353²;
 Bourg. op. cit. 1890, 175³ *.
Carphurus atromaculatus, Pic, Mélanges exot.-entom. xxvii. p. 6
 (1918)⁴.
Carphurus atromaculatus, v. *diversipennis*, Pic, Mélanges exot.-entom.
 xxxiii. p. 19 (1921)⁵.
 ? *Carphurus tonkineus*, Pic, Bull. Mus. Paris, xxviii. p. 52 (1922)⁶.

♂. Anterior tarsal joint 1 small, nigro-pectinate beneath; head bi-impressed between the eyes, as in ♀.

Var. *a*.—The dorsal abdominal segments 1–4 and 5 at the base nigro-fasciate, the scutellum, the elytra at the sides or almost entirely, and the rest of the abdomen testaceous, (♂.)

Var. *β*.—All the abdominal segments nigro-fasciate or black. (♀.)

Length 5–7½ mm. (♂ ♀.)

Hab. "INDIA" (*Mus. Brit.*); CEYLON¹; TENASSERIM; COCHIN CHINA³; SIAM; PENANG; SINGAPORE; MT. OPHIR; JAVA³; BORNEO, Sarawak, Pengaron, Quop; LAOS, Luang Prabang (*Salvaza*: var. *β*); TONKIN^{2 3 6}; PHILIPPINES (*Semper*), Dapitan (*C. F. Baker*: No. 17052), Palawan; SUMATRA⁵; MOLUCCAS, Ceram [var. *a*] and Buru (*Wallace, in Mus. Oxon.*), Ilat, Buru (*Doherty*).

The numerous specimens of this widely distributed Malayan insect in the Museums of London and Oxford, including many captured by Wallace, agree with the descriptions of Motschulsky¹, Fairmaire², and Pic⁴, and the *C. tonkineus* of the last-named author may belong to the same species, though it would appear to have more slender antennæ. The typical form has the head, prothorax, palpi, basal joints of antennæ, anterior legs, and the two or three terminal abdominal segments testaceous, the elytra, under surface, four hinder legs, and the rest of the antennæ black, and the four basal segments of the abdomen nigro-fasciate, with the sides and apical margins testaceous; the antennæ rather stout, serrate, and very similar (as is the head) in the two sexes; the eyes rather small; the prothorax long, smooth, transversely bi-impressed on each side; the elytra about as long as the exposed five abdominal segments, in some specimens with a faint bluish or violaceous lustre. The similarly-coloured *C. vigilans*, Lea (1909), from Queensland, has a transversely strigose prothorax.

* Incorrectly quoted under the specific name *varitarsis* by Bourgeois.

15. *Carphurus basilanus*, sp. n.

♂. Very elongate, rather convex, narrow, shining, thickly clothed with long erect hairs; testaceous, the eyes, the outer half of the antennæ, elytra (except at the shoulders beneath), metasternum, the two basal dorsal abdominal segments (except along their apical margins), and the bases of the posterior femora, nigro-piceous or black; sparsely, minutely, the elytra more strongly, punctured. Head about as wide as the prothorax, longitudinally bisulcate between the eyes; antennæ very long, stout, serrate. Prothorax longer than broad, transversely sulcate before the base and also at the sides anteriorly. Elytra elongate, parallel, equalling the five exposed segments in length. Anterior tarsal joint 1 about as long as 2 and 3 united, nigro-pectinate beneath.

Length 5 mm.

Hab. PHILIPPINES, Basilan Isl. (*C. F. Baker*: No. 17049).

One ♂. A close ally of the variable *C. rubroannulatus*, Motsch., differing from that insect in its much narrower shape, parallel elytra, and testaceous legs, the posterior femora infusate at the base only. The antennæ are much stouter and the elytra longer and narrower than in *C. dispar*, Er.

16. *Carphurus bivittatus*, sp. n.

♂. Very elongate, robust, shining, finely pubescent, with scattered long hairs intermixed; rufo-testaceous, the eyes, scutellum, elytra (the flavous sutural and lateral margins excepted), metasternum, and abdomen (the three terminal segments and the margins of the others excepted) nigro-piceous or black, the front of the head and the basal margin of the prothorax pale yellow; the elytra densely, rugulosely, the head and prothorax very sparsely, finely, punctate. Head rather short, not so wide as the prothorax, obliquely earinate and impressed on each side between the eyes, the latter not very large; antennæ stout, moderately long, serrate. Prothorax broader than long, subcordate, transversely depressed before the base. Elytra about $2\frac{1}{2}$ times the length of the prothorax, subtruncate at the tip, leaving five abdominal segments exposed. Legs rather stout, anterior tarsal joint 1 widened, nearly as long as 2-4 united, extended over 2, nigro-pectinate along the lower edge.

Length $7\frac{1}{2}$ mm.

Hab. MOLUCCAS, Buru (*Wallace, in Mus. Oxon.*).

One ♂. A very elongate, robust, rufo-testaceous form, with the elytra (the flavous sutural and lateral margins excepted), metasternum, and basal half of the abdomen black, the head and prothorax rather short, the antennæ stout, and the basal joint of the anterior tarsi thickened and extending over 2 above. The prothorax is transversely cordate, much as in *C. fasciatifrons*.

17. *Carphurus muiri*, sp. n.
(Pl. I. fig. 16, elytra in profile.)

♂. Very elongate, narrow, shining, clothed with fine pubescence intermixed with very long, erect, blackish hairs, the legs also with long bristly hairs; testaceous, the eyes and elytra (except along the suture in some specimens) black; the elytra closely, rather strongly punctate, the rest of the upper surface almost smooth. Head (including the somewhat prominent eyes) slightly wider than the prothorax, with a trapezoidal, bisulcate interocular depression, limited posteriorly by a v-shaped ridge, behind which there is a pencil of erect hairs in the middle and a deep triangular cavity on each side; antennæ moderately long, stout, serrate. Prothorax as long as broad, convex, deeply transversely depressed before the base, and also hollowed on each side anteriorly. Elytra wider than the prothorax, elongato-subquadrate, armed with a stout, oblique, hook-like tooth at the sides below the humeri, subtruncate at the apex, leaving five abdominal segments exposed. Anterior tarsal joint 1 narrow, rather short, nigro-pectinate along the lower edge.

♀. Head hollowed and bisulcate between the eyes; antennal joints 9-11 and the intermediate and posterior femora black in one specimen; elytra feebly sinuate along the lower margin.

Length 4-4½ mm. (♂ ♀.)

Hab. LARAT (F. Muir: ♂ ♀); TENIMBER, Jandema (Doherty: ♂); Letti I. [type] (Doherty: ♂).

Five ♂♂, two ♀♀, the legs and antennæ varying in colour in the latter. Differs from *C. cinctipennis*, Pic, from Timor &c., in the stronger elytral puncturing, the ♂ with a fasciculate head, wholly testaceous antennæ, and a longer hook-like tooth at the sides of the elytra. *C. muiri* is related to the Australian *C. fasciculatus*, Lea.

18. *Carphurus cinctipennis*.

♀. *Carphurus cinctipennis*, Pic, Mélanges exot.-entom. xxvii. p. 7 (1918).

♂. Head depressed anteriorly, and with two smooth deep foveæ between the eyes, the foveæ preceded by an angulate transverse ridge and limited externally by a curved tuberculiform prominence; antennæ long, stout, serrate; elytra triangularly dilated at the sides below the humeri; anterior tarsal joint 1 short, nigro-pectinate beneath.

♀. Head simply bi-impressed; elytral margins feebly sinuate.

Length $3\frac{1}{2}$ – $5\frac{1}{2}$ mm. (♂ ♀.)

Hab. TIMOR [*type of Pic*], Mt. Leo, Dilli (*Doherty*); FLORES (*Wallace, in Mus. Oxon.*), Endé (*Doherty*); ALLOR Is., Pura and Maru (*Doherty*).

A long and variable series of this species was captured by Doherty in Timor and other islands, mostly at elevations between 2000 and 4000 ft. A narrow, elongate, shining form, testaceous in colour, with the antennal joints 6–11, the base of the head to a variable extent, a narrow median vitta on the prothorax (often wanting, as in the type), the scutellum, the elytra on all sides (usually leaving a common broad elongate pallid space on the disc and the scutellar region infuscate), and a transverse fascia on the abdominal segments 4 and 5, black. The prothorax is long, almost smooth, bi-impressed on each side. The elytra are oblong-subquadrate, closely punctured, and in the ♂ triangularly dilated at the sides below the humeri. *C. cinctipennis* belongs to Lea's group A, near his *C. uncinatus*. An allied unnamed form before me, from the Adelaide River, N.W. Australia, comes very near it.

19. *Carphurus dispar*.

Carphurus dispar, Er. Entomographien, p. 133 (♂, nec ♀) (1840).

Hab. BINTAM I., Gulf of Singapore (*type of Erichson*); SINGAPORE (*Baker*); PENANG (*ex coll. Pascoe, in Mus. Brit.*).

It is highly probable that the black ♀ referred to *C. dispar*, the ♂ of which is described as having the head, prothorax, and legs testaceous, belongs to a different species. Specimens of a *Carphurus* from Penang and Singapore, presumably ♀ ♀ (as the tarsal comb is absent), may be conspecific with Erichson's ♂, from the description of which they differ in having the scutellum testaceous and the posterior legs partly

infusate, characters of no importance. They have very elongate, rather stout, sharply serrate antennæ; the head large, transversely impressed between the eyes; the prothorax elongate, smooth, deeply transversely sulcate at the base and also at the sides anteriorly; the elytra black, nearly as long as the exposed five abdominal segments, extremely finely punctate.

20. *Carphurus amboynensis*, sp. n.

♂. Very elongate, narrow, shining, sparsely, finely pubescent, with intermixed longer hairs; black, the head (except at the base), the antennal joints 1-4, prothorax, and the tibiæ and tarsi in part or entirely, testaceous; the head closely, the prothorax sparsely, the elytra very finely punctured. Head broad, trifoveate between the eyes, the latter large and prominent; antennæ long, rather stout, sharply serrate. Prothorax longer than broad, rather narrow, transversely sulcate before the base and also at the sides anteriorly. Elytra long, parallel, equalling the exposed five segments in length. Anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate beneath.

Length 4 mm.

Hab. AMBOYNA (*Wallace, in Mus. Oxon.*).

One ♂. The more closely punctured, basally-infuseate head, the prominent larger eyes, and the wholly infuseate femora separate this species from the insect here identified as *C. dispar*, Er.

21. *Carphurus dilutus*, sp. n.

♂. Elongate, shining, pilose; head (eyes excepted), antennal joints 1 and 2, prothorax, and abdomen wholly or in great part, testaceous or rufo-testaceous, the rest of the antennæ, metasternum, and legs (the testaceous anterior knees and tarsi excepted) nigro-piceous or black; the elytra dilute piceous or brownish, with the humeri or sides flavescent, the pallid coloration in one example extending over the entire surface, a common triangular scutellar patch excepted; the head and prothorax very sparsely, the elytra closely, punctate. Head broad, feebly trifoveate anteriorly, the eyes large; antennæ stout, moderately long, obliquely serrate, joints 4-10 broader than long. Prothorax transverse, convex, rounded at the sides, narrowed behind, transversely grooved before the base. Elytra soft, much broader than the prothorax, widened posteriorly, moderately long, rounded at the tip, leaving four or five abdominal segments exposed. Anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the entire lower edge.

Length $3\frac{1}{2}$ – $4\frac{1}{4}$ mm.

Hab. PHILIPPINES (*Semper*, in *Mus. Brit.*), Island of Basilan (*Baker*: Nos. 17048, 17050, 17051), Los Baños, Mindanao, and Palawan (*Baker*).

Described from four ♂♂ and two ♀♀. This is a Philippine form of *C. transparipennis*, Motsch., and *C. malaccanus*, Pic, differing from both of them in the stouter and more obliquely serrate antennæ in the ♂, and in the red head and prothorax. The dilute coloration of the elytra is common to *C. ruficeps* and *C. sumatrensis*, Pic, and other species of the genus, *C. sumatrensis* having a very rugose head and a less convex prothorax.

22. *Carphurus sumatrensis*.

Carphurus sumatrensis, Pic, L'Echange, xxii. p. 57 (1906).

♂. Head as wide as the prothorax, almost unimpressed; antennæ stout, strongly obliquely serrate; anterior tarsal joint 1 nearly as long as 2–4 united, nigro-pectinate along the lower edge, 2 and 3 short, slender.

♀. Antennæ less widened.

Length 4–5 mm.

Hab. TENASSERIM; SIAM; PERAK; MT. OPHIR (*Wallace*); PENANG; BORNEO, Sandakan, Pengaron, and Sarawak; SUMATRA (*type of Pic*); PHILIPPINES, Basilan and Palawan (*Baker*).

There are twenty of this species in the British Museum and one from Mt. Ophir at Oxford. A moderately elongate, nigro-cæruleous insect, with the anterior portion of the head, palpi, basal joints of the antennæ, anterior tarsi, and abdomen in great part or entirely, rufescent or rufo-testaceous; the prothorax transverse, not very convex, deeply transversely grooved before the base; the elytra (in the type) with a transparent flavescent lateral stripe extending from the base to near the apex, which is often obsolete; the head densely, rugosely, the prothorax sparsely, finely, and the elytra closely, punctured. *C. rubroannulatus*, Motsch., has a similar extended distribution in the Malayan region.

23. *Carphurus philippinus*, sp. n.

♂. Elongate, shining, pilose; nigro-cæruleous, the head to a variable extent in front, palpi, basal joints of antennæ, anterior tarsi, and abdomen (except at the base and tip) testaceous or rufo-testaceous, the rest of the antennæ and legs black; the elytra sometimes in part brownish or semi-transparent (leaving a triangular scutellar patch and the apex metallic), or with a transverse or oblong yellowish patch on

the disc; the head (except at base) and prothorax rather sparsely, the elytra very closely, finely punctured. Head short, a little wider than the prothorax, the eyes large; antennæ stout, obliquely serrate, joints 4-10 broader than long. Prothorax transverse, rounded at the sides, moderately convex, transversely grooved before the base and also on each side anteriorly, in some specimens more roughly punctured and feebly transversely strigose towards the sides. Elytra widened posteriorly, moderately elongate, leaving four or five abdominal segments exposed. Anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the lower edge.

Vars. The head (except at base) and antennal joints 1, 2, and 11 rufo-testaceous (♀), or the abdomen in great part infusate (♂).

Length 3-4½ mm.

Hab. PHILIPPINES, Mindanao (*Baker, Semper*: ♂ ♀), N. Luzon (*Whitehead*: ♂), Mt. Makiling [type] and Los Baños (*Baker*: ♂ ♀), Palawan and Basilan (*Baker*).

An extremely variable insect, if the numerous ♀ ♀ sent me by Mr. Baker all belong to the same species, differing from the widely-distributed *C. sumatrensis*, Pic, in their smoother head, the testaceous space on the elytra (when present) not in the form of a lateral stripe. The metallic coloration, &c., separate *C. philippinus* from *C. malaccanus*, Pic, and *C. transparipennis*, Motsch.

24. *Carphurus transparipennis*.

? *Carphurus transparipennis*, Motsch. Etudes ent. iii. p. 45 (1854) (♀).

? *Carphurus bipartitus*, Pic, Mélanges exot.-entom. xxxiii. p. 19 (May 1921).

♂. Elongate, rather broad, shining, pilose; black or piceous, the basal four or five joints of the antennæ and the anterior legs in part testaceous, the elytra whitish and semi-transparent from a little below the base to near the apex, the pallid coloration sometimes extending over their entire surface, the prothorax and abdomen obscurely rufescent in immature examples. Head broad, finely punctured, bi-impressed between the eyes, the latter rather large; antennæ serrate, not very long, stout, joints 7-10 transverse. Prothorax transverse, broad, convex, flattened laterally, rounded at the sides, closely, finely punctured, smoother along the median line, transversely grooved before the base. Elytra soft, widened posteriorly, rather long, truncate at the apex, leaving four or five abdominal segments exposed; densely, very finely punctured. Anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate along the lower edge.

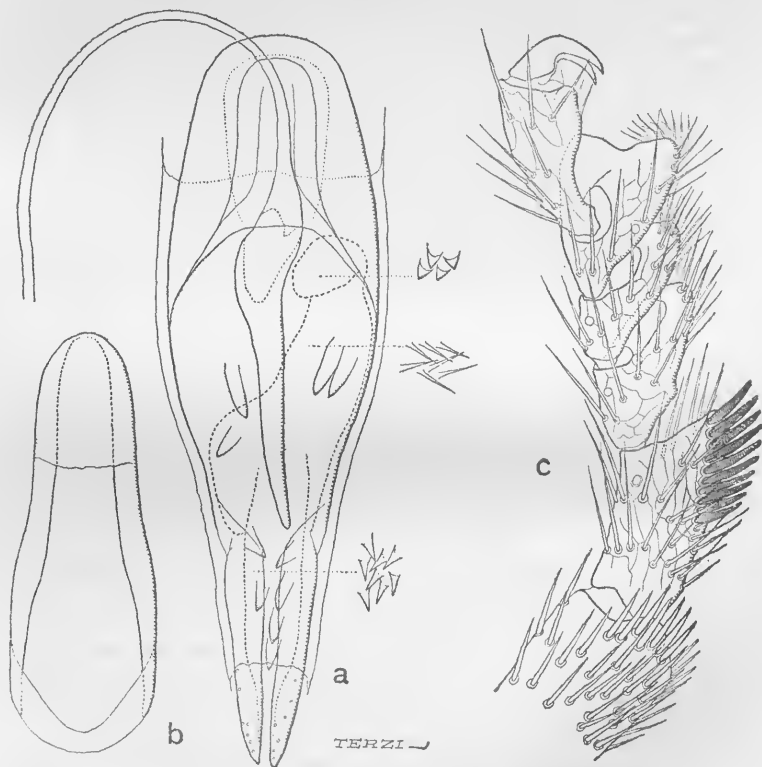
♀. Antennae a little more slender.

Length 3-4 mm.

Hab. "IND. OR." (Motschulsky); ASSAM, Patkai Mts., Nagas, and PERAK (Doherty); BORNEO, Quop and Mt. Matang (G. E. Bryant); MALAY ARCHIPELAGO [locality wanting] (Wallace, in *Mus. Oxon.*); SUMATRA (type of Pic).

Numerous examples. Motschulsky's brief description almost certainly refers to this insect, which seems to be a form of *C. malaccanus*, Pic, with the elytra in great part whitish and semitransparent, occurring at the same localities. *C. bipartitus*, Pic, has the elytra broadly whitish posteriorly, and the base and sides black. A broader and more robust ♀ from Tonglu, Sikkim, alt. 10,000 ft. (Stevens), comes very near the present species.

Fig. 2.

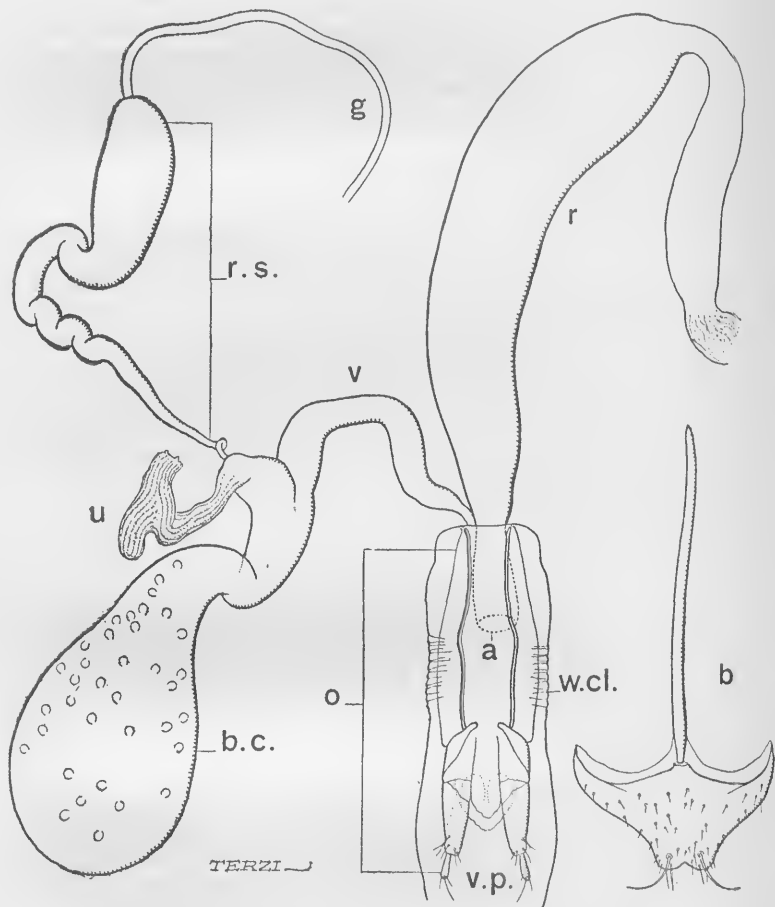


Carphurus basalis, ♂: a, genitalia; b, spiculum?; c, anterior tarsus and apex of tibia.

25. *Carphurus basalis*, sp. n.

♂. Elongate, narrow, shining, finely pubescent; black, the antennæ (the terminal 2-5 joints excepted), the base of

Fig. 3.



Carphurus basalis, ♀ : genitalia: *w.cl.*, wall of cloaca; *o.*, ovipositor; *v.p.*, vaginal palp; *a.*, anus; *r.*, rectum; *v.*, vagina; *r.s.*, receptaculum seminis; *g.*, gland; *u.*, uterus; *b.c.*, bursa copulatrix; *b*, 8th sternite and supporting strut.

the elytra broadly, the tibiæ, and tarsi testaceous; the entire upper surface very finely punctured, the prothorax smoother on the disc anteriorly and rugulose behind. Head (including

the prominent eyes) broader than the prothorax, trifoveate; antennæ long, a little thickened outwards, joints 5-10 elongate-triangular. Prothorax convex, about as long as broad, sinuously narrowed posteriorly, transversely depressed before the base. Elytra oblong-subquadrate, a little widened posteriorly, leaving four or five abdominal segments exposed. Terminal abdominal segment emarginate at tip. Legs slender; anterior tarsal joint 1 narrow, as long as joints 2 and 3 united, nigro-pectinate along the outer half beneath, the comb furnished with ten teeth (text-fig. 2, c).

♀. Antennæ a little more slender.

Length $2\frac{1}{2}$ - $3\frac{1}{2}$ mm.

Hab. CEYLON (*Thwaites*, in *Mus. Oxon.*: ♂ ♀), Kandy (*G. E. Bryant*: vi. 1908: ♂ ♀).

A long series, the sexes in about equal numbers. A small, narrow, shining black form, with the antennæ (except two or more of the terminal joints), base of elytra, tibiæ, and tarsi clear testaceous; the ♂ with the black comb extending along the outer half of the basal joint of the anterior tarsi beneath. This structure and the genitalia of the two sexes are shown on text-figures 2 and 3. *C. nigriritulus* (infra, No. 27) is probably a more widely distributed dark form of the same species, which requires a distinctive name. Neither of these insects can be identified from Motschulsky's papers on Ceylon insects.

26. *Carphurus malaccanus*.

? *Carphurus malaccanus*, Pic, *Mélanges exot.-entom.* xxv. p. 9 (1917).

♂ ♀. Very like *C. transparipennis*, Motsch., the elytra wholly piecous or black, the abdomen in some specimens rufescent to near the tip. Antennæ and anterior tarsi similarly formed.

Length 3- $3\frac{1}{2}$ mm.

Hab. TENASSERIM; PERAK [*type of Pic*]; BORNEO, Pengaron (*Mus. Brit.*).

A long series of specimens from Tenasserim, and others from Perak and Pengaron, all found by Doherty, are referred to the imperfectly described *C. malaccanus*, Pic, the structure of the antennæ, tarsi, &c., not being mentioned. A ♂ from W. Almora, India (*H. G. C.*), with a smoother prothorax, may belong here. The type (♀) of *C. nigrinus*, Gorh., from Belgaum, is very like the same sex of *C. malaccanus*, differing from it in the more slender, subfiliform antennæ and the basally-narrowed prothorax.

27. *Carphurus nigrutilus*, sp. n.

? *Carphurus nigrinus*, Gorh. Ann. Soc. Ent. Belg. xxxix. p. 321 (part.) (1895).

♂. Elongate, narrow, shining, finely pubescent; black or piceous, the four or five basal joints of the antennæ, and sometimes the tarsi also, testaceous, the head sometimes reddish in front; the upper surface very finely punctulate. Head (including the rather large, prominent eyes) wider than the prothorax, trifoveate anteriorly; antennæ long, not very slender, joints 6-10 longer than broad, subtriangular. Prothorax broader than long, sinuously narrowed behind, transversely depressed before the base and also on each side anteriorly, the disc in some specimens feebly transversely strigose. Elytra moderately long, a little widened posteriorly, depressed on the disc below the base, leaving five abdominal segments exposed. Terminal abdominal segment deeply emarginate and bidentate at tip. Anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the whole or part of the lower edge.

♀. Antennæ a little more slender.

Length $2\frac{1}{4}$ - $3\frac{1}{2}$ mm.

Hab. INDIA, Central Almora, Kumaon (*H. G. C.*: ♂), Belgaum (*H. E. Andrewes*: ♀); Assam and Momeit, Burma; CEYLON (*Thwaites*: ♂ ♀), Kandy (*G. E. Bryant*: ♂ ♀), Galle (*G. Lewis*: ♀).

The above description is taken from a long series from Ceylon and Assam. The Kandy specimens are taken as typical; those from Kumaon, Assam, and Burma are smaller, and have the antennæ more slender, thus coming near the type (♀) of *C. nigrinus*, Gorh. (No. 41), which has these organs subfiliform and joints 1 and 2 only testaceous. The Ceylon examples were found with *C. basalis*. The second Belgaum specimen (♀) referred to *C. nigrinus* by Gorham is piceous, with the head reddish. The tarsal comb varies in development in the Assam series, but in the numerous ♂♂ from Ceylon it is more extended than in any of the numerous specimens of *C. basalis* before me; in the single ♂ taken in Almora, which may belong to a different species, it is reduced to six teeth. The nearly allied *C. filicornis* (No. 40) has slender filiform antennæ in both sexes, and a very deep basal groove on the prothorax.

28. *Carphurus tondanus*, sp. n.

♀. Very elongate, narrow, shining, pilose; black, the head piceous, the antennal joints 1-4, and anterior tarsi in

part, testaceous, the elytra with a slight bluish lustre; the upper portion of the head and the prothorax sparsely finely, the elytra very closely and rather strongly, punctured. Head (including the small prominent eyes) a little broader than the prothorax, rather narrow, transversely excavate and rugosely punctate anteriorly; antennae moderately long, rather slender, joints 6-10 sharply oblong-triangular. Prothorax convex, narrow, as long as broad, oblongo-cordate, deeply transversely grooved before the base, and also depressed on each side anteriorly. Elytra as long as the five exposed abdominal segments, narrowed anteriorly.

Length 5 mm.

Hab. N. CELEBES, Tondano (*Wallace, in Mus. Oxon.*).

One ♀. A very elongate, narrow, black form, resembling *C. nigrutilus*, from India, Ceylon, &c., but of stouter build, and with a longer, basally-excavate prothorax, submetallic, densely, subrugulosely punctured elytra, &c. *C. rufonotaticeps*, Pic (1917), from Toli-Toli, Celebes, which is compared with *C. plicatcollis* by its describer, is probably a broader insect; the incomplete diagnosis, however, agrees in some respects with the Tondano specimen before me.

29. *Carphurus dapitanus*, sp. n.

♂. Very elongate, narrow, shining, finely pubescent, with intermixed long hairs, which are conspicuous on the tibiae and abdomen; black, the antennal joints 1-3 partly testaceous. Head a little wider than the prothorax, obliquely narrowed behind the eyes, the latter prominent, small, the interocular space strongly trifovcate; antennae long, widened, sharply serrate from joint 4 onward, 5-10 longer than broad. Prothorax convex, as long as broad, almost smooth, deeply transversely grooved before the base and also excavate on each side anteriorly. Elytra much broader than the prothorax, widened posteriorly, elongate, longer than the five exposed abdominal segments, closely, finely punctured. Legs slender; anterior tarsal joint 1 thickened, as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Antennae shorter.

Length $4\frac{1}{4}$ mm.

Hab. PHILIPPINES, Basilan I. [♀], Dapitan, Mindanao (*Baker*: No. 17053, type, ♂).

Three ♂♂, two ♀♀. A shining black form, not unlike *C. rouyeri*, Pic, with more elongate, closely punctured elytra, the ♂ with dilated acutely serrate antennae and a much shorter basal joint to the anterior tarsi. The transversely sulcate

prothorax and the broader fourth tarsal joint distinguish the present species from *Carphuroides pectinatus*, *C. dentiger*, &c. The Australian *Helcogaster niger*, Lca, approaches the present species.

30. *Carphurus batchianus*, sp. n.

♀. Elongate, very shining, clothed with fine pubescence intermixed with long blackish hairs, the latter also extending to the tibiae; black, the elytra nigro-piceous, the head in front, the antennal joints 1 and 2, the knees, and the tarsi in part, testaceous; the elytra densely, finely, the rest of the upper surface very sparsely, punctured. Head (with the very large prominent eyes) much wider than the prothorax, bi-impressed in front; antennae moderately long, stout, joint 1 comparatively slender, 2 short, 3 stouter, triangular, 4-10 sharply serrate. Prothorax rather narrow, as long as broad; deeply, transversely grooved before the base and also excavate towards the sides anteriorly, the depressions (as seen in profile) longitudinally confluent laterally. Elytra much broader than the prothorax, widening posteriorly and there twice the breadth of the latter, flattened on the disc, subtruncate at the apex, leaving five abdominal segments exposed. Anterior tarsal joint 1 slender, without comb.

Length $4\frac{1}{2}$ mm.

Hab. BATCHIAN, Labuan [Laboean] (*Doherty*).

One specimen, assumed to be ♀. This Batchian form may be known by its black body, the polished head and prothorax, and the densely, finely punctate, pubescent elytra; the large head and eyes; the stout, sharply serrate antennae; and the laterally-confluent excavations on the prothorax. These characters separate *C. batchianus* from the Philippine *C. dapitanus* (type, ♂), which is the nearest allied species known to me; the latter has longer and less dilated antennae, a smaller head, much smaller eyes, and more sparsely punctured elytra.

31. *Carphurus pilicornis*, sp. n. (Pl. I. fig. 9, antenna, ♂.)

♂. Very narrow, elongate, slender, shining, sparsely pubescent; black, the basal joint of the antennae sometimes in part testaceous. Head wider than the prothorax, depressed, trifoveate, and finely punctured between the eyes, and obliquely narrowed behind them, the eyes prominent, rather small; antennae shortly pilose, very long, rather slender, about reaching the apices of the elytra, joints 4-10

elongate-triangular, 1-3 nodose. Prothorax about as broad as long, almost smooth, depressed before the base and at the sides anteriorly. Elytra subparallel, a little longer than the five exposed abdominal segments, sparsely punctulate. Terminal abdominal segment truncate at tip. Legs slender; anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate along the outer half beneath.

♀. Antennæ much shorter, subfiliform; head trifoveate. Length $2\frac{3}{4}$ - $3\frac{1}{2}$ mm.

Hab. S. INDIA, Kodaikanal (T. V. Campbell).

Three ♂♂, one ♀. Narrower than *Carphuroides dentiger* (infra) from the same locality; the antennæ less elongate and feebly serrate in ♂, slender and subfiliform in ♀; the fourth tarsal joint more distinctly lobed, the prothorax depressed at the base and sides. The general facies is that of a *Malthodes*, for which the present insect might be mistaken. The ♂ tarsal comb is not easily seen. Specimens of this species and of *C. dentiger* have been presented to the British Museum by Mr. E. A. Butler.

32. *Carphurus tener*, sp. n.

♂. Elongate, very narrow, shining, finely pubescent; black or pieceous, the elytra brownish, the basal two or three joints of the antennæ in part, the tibiæ, and the tarsi more or less, testaceous. Head (including the prominent eyes) much broader than the prothorax, triangular, obliquely narrowed behind, closely punctured, the interocular space trifoveate; antennæ very long, rather stout, joints 4-10 elongate-triangular, 1-3 somewhat nodose. Prothorax narrow, convex, broader than long, narrowed anteriorly, laterally compressed, almost smooth. Elytra soft, coriaceous, elongato-subquadrate, slightly widened posteriorly, longer than the exposed four or five abdominal segments, closely, finely punctured. Terminal abdominal segment bifid at tip. Anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate in its outer half beneath.

Length $2\frac{1}{5}$ -3 mm.

Hab. CEYLON, Dikoya and Bogawantalawa, alt. 3800-5200 ft. (G. Lewis: xii. 1881-iii. 1882).

Six ♂♂. This insect has wholly the facies of a small *Malthodes*, differing from that genus in the relatively broader elytra, conical abdomen, &c., the ♂ with tarsal comb and simple genital structure. The bifid terminal segment of the abdomen, the testaceous tibiæ, and the brownish, coriaceous, more closely punctured elytra separate

C. tener from the same sex of *C. pilicornis*, which has similar antennæ. *Maltypus infuscatus*, Motsch., also from Ceylon, cannot be conspecific with the present insect.

33. *Carphurus molliculus*, sp. n.

♂. Very elongate, narrow, polished, sparsely pilose; black, the antennal joints 1 and 2 or 1-3 (except 1 above) in great part testaceous, the elytra soft and somewhat transparent, the legs sometimes paler. Head (including the rather small prominent eyes) wider than the prothorax, finely punctured, triangularly depressed and bifoveate between the eyes; antennæ moderately long, rather stout, serrate from the fourth joint onward, 1-3 subnodose. Prothorax narrow, nearly as long as broad, convex, compressed laterally towards the base, almost smooth. Elytra a little broader than the head, as long as the exposed five abdominal segments, subparallel, depressed along the suture at the base, obsoletely punctulate. Terminal abdominal segment truncate at tip. Anterior tarsal joint 1 slightly thickened, as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Antennæ a little shorter, more slender, subfiliform; head not wider than the prothorax.

Length 3-3½ mm.

Hab. CEYLON, Dikoya, alt. 3800-4200 ft. (*G. Lewis*: xii. 1881-ii. 1882).

Two ♂♂, two ♀♀. A very narrow, elongate, polished black insect, with a latero-basally compressed prothorax and soft translucent elytra. A close ally of the S. Indian *C. pilicornis*, with smoother elytra, the antennæ of the ♂ much shorter and less pilose, those of the ♀ a little shorter. The fourth tarsal joint is very little broader than in the species here placed under *Carphuroides* (infra).

34. *Carphurus subluteolus*, sp. n.

♀. Very elongate, narrow, shining, pubescent; testaceous, the eyes black, the intermediate joints of the antennæ slightly infusate in two examples; the head and prothorax closely, finely punctured, the latter smoother down the middle of the disc in one specimen and rugulose at the sides, the elytra somewhat transparent, alutaceous, minutely punctate. Head about as wide as the prothorax, the eyes moderately large; antennæ long, subfiliform. Prothorax as long as broad, transversely grooved before the base and apex. Elytra widened posteriorly, as long as the exposed

five abdominal segments. Anterior tarsal joint 1 short, without comb.

Length $3-3\frac{1}{2}$ mm.

Hab. MOLUCCAS, Batchian [type] and Ternate (*Wallace, in Mus. Oxon.*).

Three ♀ ♀, varying a little *inter se*. They agree very nearly with Erichson's description of *C. luteolus*, based on a ♂ from the Island of Bintam, near Singapore, except as regards the antennæ, which are said to be "minus elongatæ, subserratæ, apice nigricantes," the Batchian insect having these organs (in ♀) long and subfiliform. The sides of the prothorax, too, are rugulose punctured in the latter, of which Erichson says nothing.

35. *Carphurus dichroma*, sp. n.

♂. Moderately elongate, shining, sparsely pilose; testaceous, the eyes, elytra, and metasternum black, the penultimate joint of the tarsi sometimes infuscate; the entire upper surface very sparsely punctulate. Head as wide as the prothorax, transversely depressed and trifoveate between the eyes, the latter rather small, prominent; antennæ stout, filiform, moderately long. Prothorax a little broader than long, deeply transversely sulcate before the base and also on each side anteriorly. Elytra oblong-subquadrate, leaving four or five abdominal segments exposed, slightly narrowed anteriorly, and transversely depressed below the base. Legs stout, comparatively short; anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Head a little smaller; antennæ as in ♂; anterior tarsi without comb.

Length $2\frac{1}{5}-3\frac{1}{2}$ mm.

Hab. LARAT (*F. Muir*); TENIMBER, Jandema (*Doherty: ♀*).

Two pairs from Larat, a larger ♀ from Tenimber. A small testaceous insect, with black, comparatively smooth elytra, stout, filiform antennæ in the two sexes, small eyes, and rather stout legs, these characters separating it at once from *C. dispar*, Er., ♂.

36. *Carphurus timorensis*, sp. n.

♂. Elongate, narrow, shining, finely cinereo-pubescent; black, the five or three basal joints of the antennæ and the legs in part (the bases of the femora and the middle of the tibiae more or less infuscate) testaceous, the head and prothorax rufo-testaceous; the entire upper surface very finely,

rugulosely punctured. Head (with the rather prominent eyes) a little wider than the prothorax, feebly bi-impressed anteriorly; antennæ very long, stout, subfiliform, joint 2 transversely widened, 3 a little longer than 2, the others gradually increasing in length. Prothorax transversely subcordate, depressed before the base. Elytra much wider than the prothorax, hollowed on the disc below the base, rather elongate, leaving four or five abdominal segments exposed. Legs slender; anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the entire lower edge.

♀. Antennæ not so stout; eyes a little smaller.

Length 3 mm.

Hab. DUTCH TIMOR, Mt. Leo, alt. 2000–4000 ft. (*Doherty*).

Two ♂♂, one ♀. Near *C. subluteolus*, a testaceous insect inhabiting Batchian and Ternate, with a longer, shining, and more deeply impressed prothorax, and also differing from it in having the elytra, metasternum, and abdomen black. The much longer and stouter antennæ and the closely punctured, duller upper surface separate *C. timorensis* from the similarly coloured *C. dimidiatus* type from Tenasserim.

37. *Carphurus dimidiatus*, sp. n.

♂. Elongate, narrow, shining, sparsely pubescent; black, the head (eyes excepted), antennæ (the more or less infusate joints 6–11 excepted), prothorax, anterior legs, and in one specimen (♀) the two terminal abdominal segments also, testaceous, the other legs more or less infusate; the upper surface very finely punctured (the prothorax smoother in the example with the apex of abdomen testaceous). Head (including the rather small prominent eyes) a little wider than the prothorax, the interocular space bifoveate; antennæ rather slender, slightly thickened towards the tip, subfiliform, moderately long. Prothorax about as long as broad, narrowed behind, transversely sulcate before the base and on each side anteriorly. Elytra elongato-subquadrate, leaving five abdominal segments exposed. Legs slender; anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate at the apex beneath.

♀. Antennæ as in ♂; anterior tarsi without comb.

Length $2\frac{1}{2}$ – $3\frac{1}{2}$ mm.

Hab. TENASSERIM, Tavoy and Mergui (*Doherty*).

One ♂, four ♀♀, varying in the colour of the abdomen and in the sculpture of the prothorax. The slender, partly

infusate legs and antennæ, and the less extended ♂ tarsal comb, distinguish *C. dimidiatus* from *C. dichroma*. The ♀ is rather like one of the varieties of *C. rouyeri*, Pic, from Assam, which has a very different front foot in ♂ and stouter limbs. The same coloration is common to various other members of the genus, Australian and Malayan.

38. *Carphurus albipes*.

Carphurus albipes, Pic, Mélanges exot.-entom. xxv. p. 9 (1917).

♂. Anterior tarsal joint 1 nigro-pectinate in its outer half beneath.

Hab. NEW GUINEA (type of Pic; Wallace, in *Mus. Oxon.*).

A ♂ found by Wallace, length $2\frac{1}{2}$ mm., seems to be a small specimen of this species. It is a very elongate, extremely narrow, black insect, with the front of the head, the basal joints of the antennæ, and the abdomen obscurely rufescent, and the legs yellow; the antennæ filiform; the head and prothorax strongly punctured, the latter about as long as broad, rugose at the sides, and transversely sulcate before the base; the elytra elongate, parallel, finely punctured, as long as the five exposed terminal segments; the legs very slender.

39. *Carphurus scabridus*, sp. n.

♂. Elongate, narrow, moderately shining, finely pubescent; nigro-piceous, the antennal joints 1-4 (except a dark line on 1 above) testaceous, the rest of the antennæ, the abdomen, and legs (the tarsi in part excepted) black; the entire upper surface (the abdomen excepted) densely, very finely rugulose, the prothorax rougher at the sides than on the disc. Head as wide as the prothorax, bi-impressed in front, the eyes rather small; antennæ long, filiform, rather stout, joint 2 widened. Prothorax as long as broad, rounded at the sides, a little narrowed behind, transversely grooved before the base. Elytra depressed below the base, elongato-subquadrate, truncate at the tip, leaving five abdominal segments exposed. Anterior tarsal joint 1 as long as 2 and 3 united, finely pectinate beneath.

♀. Larger, piceous in colour, the head in front, the antennal joints 1-4, and the tarsi almost entirely, testaceous, the elytra brownish, with the base and apex darker; the head more coarsely punctured, the eyes larger, the antennæ much longer and stouter, the prothorax subcordate.

Length $2\frac{1}{2}$ - $3\frac{1}{4}$ mm. (♂ ♀.)

Hab. BURU, Ilat (*Doherty*: type, ♂); MYSol (*Wallace*, in *Mus. Oxon.*: ♀).

One specimen from each island, the much larger slightly immature ♀ almost certainly belonging to the same species. A small, roughly punctulate, nigro-piceous or piceous insect, with the basal four joints of the antennæ and the tarsi in part testaceous, and rather stout, long, filiform antennæ. An isolated form.

40. *Carphurus filicornis*, sp. n.

? *Carphurus dispar*, Er. Entomographien, p. 133 (♀, nec ♂) (1840).

♂. Elongate, narrow, shining, finely pubescent; black, the antennæ with the four or five basal joints wholly or in part, and sometimes the tarsi also, testaceous; the upper surface very finely punctulate, the prothorax almost smooth on the disc anteriorly. Head not wider than the prothorax, slightly hollowed or bi-impressed in front, the eyes rather small; antennæ long, filiform, joint 2 thickened, transversely widened as seen in profile. Prothorax transverse, convex, rounded at the sides and narrowed behind, transversely sulcate before the base. Elytra widened posteriorly, a little longer than the four or five exposed abdominal segments. Legs slender; anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Antennæ filiform as in ♂, joint 2 a little less transverse.

Length 2–3 mm.

Hab. SINGAPORE [types] (*C. F. Baker*: ♂: No. 17043; *Wallace*, in *Mus. Oxon.*: ♀); BINTAM ISL. (*Erichson*: ♀); PENANG (*G. E. Bryant*: xi. 1913: ♂); PERAK, SIAM, TENASSERIM (*Doherty*); SULA ISL. (*Wallace*); BORNEO, SANDAKAN, PHILIPPINES, Mindanao and Palawan (*Baker*).

The above description is taken from a pair from Singapore, the ♀ much larger than the ♂, and from numerous other examples of small size from the localities above quoted. The ♂ of *C. dispar*, as here identified, from Singapore and Penang, is a very different insect. The filiform antennæ in both sexes, with broad second joint, and transverse, basally sulcate prothorax, should separate *C. filicornis* from *C. nigrinus*. Two of the ♂♂ from Sandakan have much larger eyes.

41. *Carphurus nigrinus*.

♀. *Carphurus nigrinus*, Gorh. Ann. Soc. Ent. Belg. xxxix. p. 321 (nec supposed ♂) (1895).

Hab. S. INDIA, Belgaum (*ex coll. Andrewes*, in *Mus. Brit.*).

The type of this small form (length $3\frac{1}{2}$ mm.) is black, with the front of the head and the two basal joints only of the antennæ rufo-testaceous; the eyes rather small; the antennæ comparatively slender, subfiliform; the prothorax as broad as long, much narrowed behind, rugulosely punctured laterally, and feebly transversely strigose on the disc posteriorly; the elytra moderately elongate (leaving five segments exposed), finely punctulate; the legs slender. The supposed ♂ of *C. nigrinus** is a ♀ of an allied species, with stouter, subserrate antennæ; it is here referred to *C. nigrutilus* (No. 27).

42. *Carphurus zeylanicus*, sp. n.

♂. Elongate, narrow, slender, shining, sparsely pilose; black, the antennal joints 1 and 2 wholly or in part testaceous, the terminal three segments of the abdomen rufescent; the head and prothorax sparsely, minutely punctured, the elytra duller, coriaceous, obsoletely punctulate. Head small, slightly wider than the prothorax, bisulcate anteriorly, the eyes somewhat prominent; antennæ long, subfiliform, rather slender, joints 3–10 longer than broad. Prothorax convex, a little broader than long, compressed laterally, and transversely depressed on each side before the base and apex (the depressions appearing longitudinally confluent towards the outer margin when seen in certain lights). Elytra subparallel, rather longer than the exposed abdominal segments. Legs slender; anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the outer half beneath.

♀. Antennal joints 1–4 and tarsi in part testaceous, the abdomen black; antennæ a little more slender.

Length $2\frac{1}{2}$ – $3\frac{1}{2}$ mm.

Hab. CEYLON, Bogawantalawa, alt. 5000 ft. [type, ♂], and Kitulgalle, alt. 1700 ft. [♀] (*G. Lewis*: i, ii. 1882).

One pair. Narrower than *C. nigrutilus*, the elytra duller and obsoletely punctulate, the terminal segments of the ♂-abdomen rufous, the antennæ in ♂ a little stouter, shorter, and less filiform than in the same sex of *C. filicornis*.

43. *Carphurus matanganus*, sp. n.

♂. Moderately elongate, somewhat robust, shining, finely cinereo-pubescent; nigro-piceous, the antennal joints 1–6 and the tibiæ and tarsi clear testaceous; the upper surface

* Quoted under the specific name *nigrarius* by Pic in his diagnosis of *C. madurensis* (1921).

very finely punctulate. Head as wide as the prothorax, trifoveate between the eyes, the latter rather large; antennæ stout, very long, about reaching the apex of the elytra, joints 6-10 much longer than broad, slightly widened outwards. Prothorax transverse, very convex, sinuously narrowed behind, deeply, transversely sulcate before the base and also deeply excavate on each side anteriorly. Elytra rather broad, widened posteriorly, depressed on the disc below the base, leaving about four abdominal segments exposed. Legs not very slender; anterior tarsal joint 1 as long as 2 and 3 united, conspicuously nigro-pectinate along the lower edge.

Length $2\frac{1}{2}$ mm.

Hab. BORNEO, Mt. Matang, W. Sarawak (*G. E. Bryant* : i. 1914).

One ♂. A dull black form allied to *C. filicornis*, with the basal half of the antennæ, the tibiæ, and tarsi testaceous, the antennæ themselves unusually long and stout for such a small insect.

44. *Carphurus atricolor*, sp. n.

♂. Moderately elongate, very shining, sparsely cinereo-pubescent, with longer hairs intermixed; deep black, the basal joints of the antennæ in part and the tips of the tarsi testaceous; the entire upper surface very sparsely punctulate. Head not wider than the prothorax, bi-impressed in front, the eyes small; antennæ long, stout, filiform, joint 2 transverse, subquadrate, 1 somewhat thickened. Prothorax broader than long, convex, rounded at the sides, deeply transversely grooved before the base. Elytra wider than the prothorax, moderately long, truncate at the apex, leaving four or five abdominal segments exposed, transversely depressed below the base. Legs not very elongate; anterior tarsal joint 1 short, nigro-pectinate beneath.

♀. Antennæ similar.

Var. Abdomen testaceous.

Length $2\frac{3}{4}$ - $3\frac{1}{2}$ mm.

Hab. DUTCH TIMOR, Mt. Leo, alt. 2000-4000 ft. [types: ♂ ♀, ALLOR Is., Pura and Maru [♂], and LETTI I. [♀, var.] (*Doherty*); CERAM (*Wallace, in Mus. Oxon.*: ♀).

Numerous examples. A small, very shining, glossy black, comparatively smooth insect, with stout, filiform antennæ, extremely like *C. nodicornis* and *C. papuanus* (infra), from New Guinea or Mysol; but with the basal joint of the antennæ very slightly thickened in ♂, the elytra relatively shorter

in ♀. *C. dichroma*, from Larat and Tenimber, and *C. matanganus*, from Sarawak, have similar antennae, these organs being much stouter than in *C. filicornis*.

45. *Carphurus enganoensis*, sp. n.

♀. Moderately elongate, shining, finely pubescent; black, the antennal joints 1-5 testaceous; the head and prothorax sparsely, finely punctured, the elytra extremely finely rugulose and obsoletely punctulate. Head short, narrower than the prothorax, bisulate anteriorly and with a shallow fovea between the eyes, the latter small; antennae rather stout, subfiliform, joints 3-10 a little longer than broad. Prothorax convex, narrowed behind and also in front, narrowly grooved at the base. Elytra somewhat rounded at the sides, widened posteriorly, longer than the exposed four abdominal segments. Abdomen broad, rapidly narrowing posteriorly. Legs comparatively short; anterior tarsal joint 1 without comb.

Length $2\frac{1}{2}$ mm.

Hab. SUMATRA, Engaño Isl. (*Doherty*).

One specimen, assumed to be ♀. A very small black form, with the basal half of the antennae testaceous, the antennae stout and subfiliform, the head small and short, the prothorax very convex, the elytra and abdomen rather broad, the legs comparatively short and infuseate. Allied to *C. nigrinus* and *C. filicornis*, but differing in various respects from the ♀♀ of these species. *C. niasensis*, Pic (1917), seems to approach the present insect.

46. *Carphurus rouyeri*. (Pl. I. fig. 10, front tarsus, ♂.)

♀. *Carphurus rouyeri*, Pic, L'Echange, xxii. p. 57 (1906) ?

Carphurus rouyeri v. *obscurior*, Pic, Mélanges exot.-entom. xxxiii. p. 19 (May 1921).

Var. ? *Carphurus discoidalis*, Pic, Mélanges exot.-entom. xxv. p. 8 (1917).

♂. Very elongate, narrow, sparsely pilose, shining; black, the head (except at the base or behind the eyes) rufescent, the three or four basal joints of the antennae, the anterior legs, and usually the intermediate femora also testaceous, the elytra with a broad, flavescens, semitransparent median fascia of variable width. Head wider than the prothorax, almost smooth, with a trifoveate transverse depression between the eyes, the latter large and prominent; antennae slender, extremely long, joints 4-10 elongate-triangular. Prothorax as long as broad, convex, rounded at the sides,

narrowed behind, almost smooth, deeply transversely sulcate before the base and also depressed on each side anteriorly. Elytra soft, about as long as the five exposed abdominal segments, parallel at the base, a little widened posteriorly, very finely punctured. Legs long; anterior tarsal joint 1 thickened, elongate, as long as 2-5 united, nigro-pectinate along the entire lower edge, joint 2 articulated to it at about the middle, 1 reaching as far as the apex of 3.

♀. Antennæ very much shorter, subfiliform; eyes smaller; anterior tarsal joint 1 narrow, simple, not longer than 2 and 3 united.

Var.? The elytra without trace of fascia, the prothorax in ♀ in great part testaceous (the margins only infuscate); the antennæ of ♂ stouter and with the elongated joints 4-10 more sharply triangular, the anterior tarsi in this sex with an elongated nigro-pectinate basal joint as in *C. rouyeri*, Pic.

Length 3-4½ mm.

Hab. BORNEO, Mt. Matang, Quop, and Kuching in Sarawak (*G. E. Bryant*: ♂ ♀), BANGUEY ISL. (type of *C. discoidalis*, Pic); SUMATRA, Paja Kombo (types of *C. rouyeri* and var., Pic); PERAK; PENANG; ASSAM, Patkai Mts. and Sudiya (*Doherty*: ♂ ♀, var.).

The above description is taken from numerous ♂ ♂ and ♀ ♀ from Sarawak, the ♀ ♀ from the other localities quoted agreeing with the latter and with Pic's diagnosis of *C. rouyeri*. A narrow, shining, slender, black insect, with a rufescent, trifoveate head, the antennæ and legs partly testaceous, and the elytra with a broad, flavous, semitransparent median fascia; the ♂ with extremely elongate, serrate antennæ, and an unusually long, nigro-pectinate basal joint to the anterior tarsi. *C. discoidalis*, Pic, from Banguey, diagnosed in twelve words, and the Assam pair above noted, seem to be extreme forms of the same species. A small immature ♀ from Kuching, Sarawak, with the head and anterior legs infuscate, and a broad subapical whitish elytral fascia, may represent *C. discoidalis*. *C. elegans*, Lea, has a similarly elongate basal joint to the anterior tarsi in ♂.

47. *Carphurus luzonicus*, sp. n.

♂. Extremely like *C. rouyeri*, Pic; black, the antennal joints 1-4, head, prothorax (three oblong streaks—lateral and median—at the base excepted), and legs testaceous, the elytra with a yellowish, semitransparent, narrow streak extending downward from the humeri; the head broad, transversely depressed and trifoveate between the eyes, the

latter large; the antennae equally long, reaching the tip of the elytra, joints 3-10 elongate-triangular; the prothorax almost smooth, transversely sulcate before the base and on each side anteriorly; the elytra subparallel, leaving five segments exposed; the anterior tarsi with joint 1 thickened, as long as the others united, nigro-pectinate along the entire lower edge.

Length 4 mm.

Hab. PHILIPPINES, Mt. Makiling, Luzon (*Baker, in Mus. Brit.*: No. 17047).

Described from a ♂ from Luzon; a second example, also ♂, narrower, with the prothorax entirely and the abdomen in great part testaceous, from the Island of Basilan (*Baker*), doubtless belongs to the same species. This is a Philippine form of *C. rouyeri* with the prothorax and legs testaceous, and the elytra with a narrow, oblique, semi-transparent, humeral streak. It cannot be treated as a variety of that species, and a separate name is required for it. The elongate, thickened basal joint of the ♂ anterior tarsi and the much longer, more feebly serrate antennae in the same sex separate *C. luzonicus* from *C. dispar* and *C. basilanus*.

48. *Carphurus scutatus*, sp. n.

♀. Elongate, narrow, shining, finely pubescent, with longer hairs intermixed; black, the head, prothorax, and scutellum rufo-testaceous, the antennal joints 1-4, elytra (a triangular scutellar patch and an apical fascia excepted), and legs (the femora in part and the tips of the tarsi excepted) testaceous; head and prothorax almost smooth, the elytra sparsely punctulate. Head not wider than the prothorax, bi-impressed in front and foveate in the middle between the eyes, the latter moderately large and not prominent; antennae rather slender, moderately long, somewhat filiform, joints 4-10 oblong-subtriangular. Prothorax as long as wide, relatively broad, deeply transversely depressed before the base and shallowly so towards the apex. Elytra wider than the prothorax, as long as the five exposed abdominal segments, subparallel. [Anterior tarsi wanting.]

Length $4\frac{1}{4}$ mm.

Hab. GT. SANGUIR, Taruna [Tarocna], alt. 2000 ft. (*Doherty*).

A single example, one of two species of *Carphurus*, found by Doherty on this island, which lies between Mindanao and Celebes. It may be the ♀ of *C. luzonicus*, type ♂; but this is not likely to be the case, the eyes being

less prominent and the head not wider than the comparatively broad prothorax, characters separating *C. scutatus* from the variable *C. rouyeri*, Pic. The antennæ are less filiform than in the ♀ of the latter.

49. *Carphurus nodicornis*, sp. n. (Pl. I. fig. 11,
antenna, ♂.)

♂. Elongate, shining, very sparsely pilose (abraded); black, the four basal joints of the antennæ testaceous beneath, the puncturing of the entire upper surface minute and very sparse. Head about as wide as the prothorax, bi-impressed between the eyes, the latter small; antennæ long, stout, filiform, joint 1 enormously thickened, oblongo-subquadrate. Prothorax broader than long, very convex, rounded at the sides, deeply transversely sulcate before the base. Elytra about two and a half times the length of the prothorax, subparallel, transversely depressed below the base, rounded at the tip, leaving four or five segments exposed. Anterior tarsal joint 1 short, feebly nigro-pectinate beneath.

♀. Antennal joint 1 much less thickened, normal.

Length 3-4½ mm.

Hab. NEW GUINEA [type, ♂] and MYSOLO [♂ ♀] (*Wallace, in Mus. Oxon. and Mus. Brit.*).

Two ♂♂ and one ♀. More robust than the Indian *C. nigrinus*, Gorb., with much longer and stouter antennæ, the basal joint of which is greatly enlarged in ♂; the prothorax larger, more convex, and deeply transversely sulcate behind; the elytra much smoother. A strongly incrassate basal joint to the ♂ antennæ is also to be found in the Australian *Helcogaster foveicornis* (1909) and *H. insignicornis* (1921), Lea, and *Carphurus cyaneipennis*, MacL. (1872), and in *Carphuromorphus validicornis*, Pic (1917), from Ké Island. Following Lea's arrangement, this species and the following would belong to the genus *Helcogaster*.

50. *Carphurus papuanus*, sp. n. (Pl. I. fig. 12, ♂.)

♂. Elongate, shining, the elytra closely, the rest of the surface very sparsely pubescent; black, the basal four joints of the antennæ in great part testaceous; the head and prothorax finely punctured, the latter smooth along the middle of the disc, the elytra densely, subrugulose punctured. Head short, narrower than the prothorax, transversely depressed between the eyes, the latter small; antennæ long, rather stout, filiform, joint 1 greatly thickened. Prothorax convex, a little broader than long, rounded at the sides,

deeply transversely grooved before the base and also transversely hollowed on each side anteriorly. Elytra a little more than twice the length of the prothorax, narrowed anteriorly, flattened along the suture below the base, rounded at the tip, leaving five segments exposed. Anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate beneath.

Length $4\frac{1}{2}$ mm.

Hab. NEW GUINEA, Dorey (*Wallace, in Mus. Oxon.*).

One ♂. Very like *C. nodicornis*, a species occurring in the same island; the basal joint of the ♂-antennæ also dilated; the head smaller; the prothorax not so smooth, and transversely depressed on each side anteriorly, as well as near the base; the elytra densely, rugulose punctured.

CARPHUROIDES, gen. nov.

Tarsal joints 2-4 narrow, 4 small, feebly lobed, rounded at apex, and semicircularly excavate above, joint 1 of anterior pair with a closely pectinate comb beneath in ♂; head without prominent tubercles or carinae in ♂, very similar in the two sexes; antennæ flabellate, pectinate, dentate, or serrate in ♂, serrate in ♀; prothorax without definite sulci or impressions, almost smooth; the other characters as in *Carphurus*, Er. (type *C. dispar*, ♂).

Type, *Helcogaster pectinatus*, Sharp.

In addition to *H. pectinatus*, the following species belong to *Carphuroides* as here defined:—*H. atratulus*, Gorh. (type, ♂), Central America; *H. vitreatus*, Champ., Rhodesia; *Carphurus plagiatus*, Kies. (type, ♂), Japan; *C. picipennis*, Gorh. (type, ♂), Belgaum; and various other forms from Southern India, Ceylon, or the Malayan region. The tarsal comb of the ♂, which cannot be seen from above, was overlooked by Sharp, Kiesenwetter, Gorham, and myself*; but on examining the tarsi from beneath it is plainly visible. The general facies of these Omaliiform insects is very similar, and several of them have a semi-transparent streak or elongate space on the disc of the elytra, hence the specific names *plagiatus* and *vitreatus*. The genus seems to be a natural one; but the geographical distribution of the species is difficult to understand, unless they are carried by commerce; one, *C. pectinatus*, has almost certainly been introduced into the Hawaiian Islands, as

* The words "without comb" must therefore be erased from the description of *H. vitreatus* [Ann. & Mag. Nat. Hist. (9) x. p. 356, Oct. 1922].

noted by its describer. *Carphurus* (?) *opacus*, Pic (1908), from Buenos Aires, is probably very different from any of the eastern forms.

1. *Carphuroides anamalaicus*, sp. n. (Pl. I. fig. 13, antenna, ♂.)

♂. Elongate, shining, sparsely pilose; black, the antennal joints 1 and 2 partly testaceous, the elytra (except at the apex) fusco-testaceous and somewhat transparent. Head (as seen detached) large, long, and convex, obliquely narrowed behind the eyes, closely punctured, with an irregular, V-shaped, interocular depression formed by three confluent foveæ; eyes rather prominent, not very large; antennæ pilose, flabellate from joint 5 onward, the basal joints stout. Prothorax narrow, barely as long as broad, rounded at the sides anteriorly, almost unimpressed; very sparsely, finely punctured. Elytra rather more than twice the length of the prothorax, subparallel, leaving four segments exposed, sparsely punctulate. Legs slender; tarsi subfiliform, joint 4 small and slightly hollowed at the apex above, joint 1 of anterior pair about as long as 2 and 3 united, nigro-pectinate beneath.

Length 3 mm.

Hab. S. INDIA, Anamalai Hills (*ex coll. Andrewes, in Mus. Brit.*).

One male. This is the only Malayan or Indian species of the group in the collections before me with flabellate antennæ in ♂. It is so closely related in other respects to *C. plagiatus*, Kies., and *C. pectinatus*, Sharp, that it must be included in the same genus. *C. anamalaicus* differs from the Australian species placed by Lea under the preoccupied generic name *Balanophorus*, MacL., in having slender subfiliform tarsi.

2. *Carphuroides pectinatus*. (Pl. I. figs. 14, ♂;
14 a, posterior tarsus, ♂.)

♂. *Helcogaster pectinatus*, Sharp, Trans. R. Dublin Soc. (2) iii. pp. 157, 241, 284, t. 4. fig. 20 (1885).

♀. *Carphurus astruci*, Pic, Mélanges exot.-entom. xxviii. p. 4 (1918)?

♂. Head (including the rather large prominent eyes) broader than, and deeply sunk into, the prothorax (the long basal portion thus being invisible till the head is drawn out of the cavity), with a V-shaped bi-impressed depression between the eyes which is produced into a short sulcus above; antennæ long, stout, strongly dentato-pectinate, joints 1

and 2 testaceous; anterior tarsal joint 1 about as long as 2 and 3 united, nigro-pectinate beneath, 2-4 short, small; terminal dorsal segment of abdomen emarginate at tip.

♀. Head (and eyes) smaller, not wider than the prothorax, trifoveate; antennae shorter, obliquely serrate, joints 1-3 testaceous.

Length 3-4 mm.

Hab. HAWAIIAN IS., Honolulu (type of *H. pectinatus*, ♂); PORTUGUESE TIMOR, Dilli (*Doherty*: ♂); BORNEO, Pengaron (*Doherty*: ♂); CHINA (*ex coll. Bowring*: ♀), Kurseong (type of *C. astruci*, Pic: ♀); ASSAM, Sylhet (*Mus. Brit.*: ♂ ♀); INDIA (*Mus. Oxon.*: ♀).

Six ♂♂ and two ♀♀ of this species are contained in the collections before me. It is recognizable by the black, shining body; the testaceous basal joints of the antennae; the deflexed, retractile head; the almost smooth, unimpressed prothorax, and the relatively elongate, strongly punctured, posteriorly-widened, piceous elytra, which are sometimes partly transparent. The imperfect ♂ from Timor seems to be a small narrow example of the same species. The pectinate antennae in the ♂ separates *C. pectinatus* from *C. plagiatus*, Kies. The Hawaiian specimens were found on the windows of a house in Honolulu, and the insect is recorded from there as a doubtful native. *C. astruci* is almost certainly a ♀ of *C. pectinatus*.

3. *Carphuroides dentiger*, sp. n. (Pl. I. fig. 15, antenna, ♂.)

♂. Elongate, narrow, shining, finely pubescent; black, the elytra sometimes piceous. Head a little wider than the prothorax, with a V-shaped depression between the eyes, the latter small and rather prominent; antennae shortly pilose, as long as the body, stout, joints 1-3 thickened, 4 and 5 broader, triangular, 6-10 each produced into a long sharp tooth. Prothorax nearly as long as broad, slightly rounded at the sides, almost smooth and unimpressed. Elytra long, subparallel, a little widened posteriorly, leaving four segments exposed, strongly punctured. Anterior tarsal joint 1 widened, somewhat triangular, nearly as long as 2-4 united, with 20 black teeth along the lower edge (text-fig. 4, d).

♀. Antennae nearly one-half shorter, much less widened, simply serrate; head bifoveate; anterior tarsal joint 1 small, narrow, not longer than 2 and 3 united.

Length $2\frac{3}{4}$ - $3\frac{1}{2}$ mm.

Hab. S. INDIA, Kodaikanal (*T. V. Campbell*: ♂ ♀);
 ASSAM, Shillong (*F. W. C.*: ♀).

Described from five ♂ ♂ and one ♀ from Kodaikanal,

Fig. 4.



Carphuroides dentiger, ♂ : *a*, genitalia; *b* and *c*, details of ditto, more highly magnified; *d*, anterior tarsus from in front, the setae on terminal joints omitted.

two ♀ ♀ from Assam apparently belonging to the same species. A small, narrow, shining black form, with a smooth, unimpressed prothorax, strongly punctured clytra,

and extremely elongate, stout, acutely dentate antennæ in the ♂, these organs in the ♀ short and simply serrate. The text-figures of the ♂ genitalia and anterior tarsus (fig. 4, *a-d*) are taken from preparations made by Dr. Waterston. *C. plagiatas* and *C. pectinatus* are allied forms.

4. *Carphuroides plagiatas*.

♂. *Carphurus plagiatas*, Kies. Berl. ent. Zeitschr. 1874, p. 287.

♂. Head (including the prominent eyes) about as wide as the prothorax, with a V-shaped, interocular depression (formed by three confluent foveæ); antennæ rather slender, sharply serrate; prothorax almost smooth, subcylindrical; elytra about as long as the exposed portion of the abdomen, subparallel, semi-transparent, strongly punctured; anterior tarsi as in *C. pectinatus*, Sharp.

Hab. JAPAN, Nagasaki.

Described from a single example, one of two in the Lewis collection. Very like *C. pectinatus*, Sharp, ♂, with the head very little larger than in the ♀ of that species, the eyes smaller, the antennæ much more slender (described as "filiformes, acutius serratæ"), the elytra relatively shorter and less widened posteriorly.

5. *Carphuroides nilgiriensis*, sp. n.

Carphurus picipennis, Gorb. Ann. Soc. Ent. Belg. xxxix. p. 321 (♀, nec ♂) (1895).

♂. Elongate, shining, sparsely pilose; black, the antennal joints 1 and 2 testaceous beneath; the head and prothorax very sparsely, minutely punctate, the elytra also sparsely punctured. Head (including the rather prominent eyes) about as wide as the prothorax, triangularly depressed and bifoveate anteriorly; antennæ stout, moderately long, serrate. Prothorax barely as long as broad, convex, almost unimpressed. Elytra about as long as the five exposed abdominal segments, a little widened posteriorly. Tarsi with a small penultimate joint, joint 1 of anterior pair thickened, not longer than 2 and 3 united, nigro-pectinate along the lower edge.

♀. Head smaller, the eyes less prominent; antennæ more slender, much shorter, less strongly serrate.

Length $3\frac{1}{4}$ – $4\frac{1}{4}$ mm.

Hab. INDIA, Nilgiri Hills (*H. L. Andrewes*, in *Mus. Brit.*).

Two ♂♂ and two ♀♀. Smaller and narrower than *C. picipennis*, Gorb.; the elytra much shorter, less widened posteriorly, and more sparsely punctured; the antennæ of

♂ shorter, less dilated, and not so sharply serrate. Both insects have a small fourth tarsal joint. *Carphurus homalioides*, Bourg., from Cambodia, must be a nearly allied insect. *C. plagiatus*, Kies., from Japan, has more rugose elytra, and the antennal joints 4-10 of the same width, but acutely triangular in shape, in ♂.

6. *Carphuroides nitidulus*, sp. n.

♂. Elongate, narrow, shining, sparsely pilose; black, the antennal joints 1 and 2 partly testaceous, the elytra piecous and semitransparent, each with an oblong whitish patch on the disc beyond the middle. Head (including the rather prominent eyes) slightly wider than the prothorax, finely, sparsely punctured, bi-impressed between the eyes; antennæ moderately elongate, sharply dentato-pectinate, rather stout. Prothorax convex, broader than long, narrowed anteriorly, almost unimpressed, very sparsely punctured, smooth down the middle of the disc. Elytra slightly longer than the four or five exposed abdominal segments, subparallel, very little widened at the apex; sparsely, finely punctate. Terminal abdominal segment truncate at tip. Anterior tarsal joint 1 narrow, about as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Head about as wide as the prothorax, the eyes less prominent; antennæ shorter, less dilated, serrate; elytra without the whitish spot; anterior tarsal joint 1 shorter, without comb.

Length $2\frac{1}{2}$ - $3\frac{1}{2}$ mm.

Hab. CEYLON, Kandy [♂, type], Dikoya [♀], alt. 1500-4200 ft. (*G. Lewis*: ii. 1882).

One ♂, two ♀♀. Smaller and narrower than the Japanese *C. plagiatus*, Kies., the elytra much smoother, the antennæ of the ♂ sharply dentate, those of the ♀ formed much as in the ♂ of that species. The elytra are less widened behind and more finely punctured, and the antennæ are less thickened in both sexes, than in *C. pectinatus*, Sharp. The whitish elytral spot is evanescent.

7. *Carphuroides translucens*, sp. n.

♀. Elongate, Omaliiform, shining, sparsely pilose; black, the antennal joints 1 and 2 partly testaceous, the elytra (except at the apex) whitish and semitransparent; the head and elytra sparsely punctured, the prothorax much smoother.

Head (including the comparatively small eyes) barely as wide as the prothorax, short; antennæ moderately long, rather slender, sharply serrate. Prothorax about as long as broad, subcylindrical, almost unimpressed. Elytra long, widening posteriorly, leaving four segments exposed. Legs slender; anterior tarsal joint 1 small, short, without comb.

Length $3\frac{1}{2}$ mm.

Hab. S. INDIA, Nilgiri Hills (*T. V. Campbell*).

One ♀. Less robust than the Bornean *C. luciparens*, the legs and antennæ darker and much more slender, the head not rugose, the elytra elongate. The relatively broader head and prothorax and much longer elytra separate the present species from the Japanese *C. plagiatus*, Kies., which has similarly formed antennæ. It is not likely to be the ♀ of *C. anamalaicus*, the ♂ only of which is known.

8. *Carphuroides luteiventris*, sp. n.

♀. Very elongate, Omaliiform, shining, sparsely pilose; black, the two basal joints of the antennæ, elytra, and legs piceous or fusco-testaceous, the elytra somewhat transparent, the abdomen luteous. Head short, narrower than the prothorax, coarsely, closely (in one specimen rugosely) punctured, transversely depressed anteriorly, the eyes quite small; antennæ rather short, moderately stout, serrate. Prothorax transverse, convex, narrowed anteriorly, almost unimpressed, smooth on the disc, sparsely punctured at the sides. Elytra as long as the exposed five abdominal segments, widening from the base, subtruncate at the apex, strongly punctured. Abdomen broad, narrowing from the base. Legs rather slender.

Length $3\frac{1}{2}$ –5 mm.

Hab. CEYLON, Dikoya, alt. 3000–4200 ft. (*G. Lewis*: xii. 1881–ii. 1882).

Two ♀ ♀. Very like the widely-distributed *C. pectinatus*, Sharp, the head coarsely punctured (as in the Bornean *C. luciparens*), the antennæ (♀) less thickened, the abdomen luteous. These specimens cannot be referred to *Carphurus hæmorrhoidalis*, Motsch., from the same island, that insect having the antennæ long and slender (less strongly serrate than in his eastern *C. nigripennis*), the head, prothorax, and elytra uneven, and the three terminal segments of the abdomen only in part red.

9. *Carphuroides luciparens*, sp. n.

♀. Elongate, robust, Omaliiform, shining, very sparsely pubescent; black, the antennal joints 1-4, a broad triangular patch on each side of the second abdominal segment, tibiae, and tarsi testaceous, the elytra (except along the suture and at the apex) flavescent and semitransparent. Head (including the rather small eyes) not wider than, and deeply sunk into, the prothorax, the exposed portion short, coarsely, rugosely punctured, much smoother in front; antennae moderately long, stout, obliquely serrate. Prothorax subcylindrical, convex, a little broader than long, polished, almost impunctate, unimpressed. Elytra about as long as the five exposed abdominal segments, a little widened posteriorly; sparsely, strongly punctate. Legs stout; anterior tarsal joint 1 short, without comb.

Length $4\frac{1}{2}$ mm.

Hab. BORNEO, Quop in W. Sarawak (*G. E. Bryant*: 26.iii.1914).

One example. More robust than *C. pectinatus*, Sharp, and *C. plagiatus*, Kies., the head rugosely punctured, the elytra yellowish, semitransparent, and rather sparsely punctured, the legs stouter, the tibiae and tarsi testaceous.

10. *Carphuroides picipennis*.

Carphurus picipennis, Gorh. Ann. Soc. Ent. Belg. xxxix. p. 321 (♂, nec ♀) (1895).

♂. Antennae sharply serrate, moderately long, stout; anterior tarsal joint 1 nigro-pectinate beneath, about as long as 2-4 united, the latter short, small.

Hab. S. INDIA, Belgaum (*ex coll. Andrewes, in Mus. Brit.*).

An elongate, shining, pilose, piceous insect, superficially resembling a *Lesteva* or *Geodromicus*, with a broad, finely punctured, bi-impressed head; large eyes; a transverse, smoother, almost unimpressed prothorax, unusually elongate, posteriorly widened, strongly punctured elytra, leaving four segments exposed; and a small penultimate joint to the tarsi. The type (♂) agrees very nearly with the description of *Carphurus homalioides*, Bourg. (1890)*, from Cambodia, except that it is piceous instead of black. The ♀ labelled *picipennis* by Gorham belongs to a different species, *C. nilgiriensis* (No. 5).

* The same specific name has been used by Pic for a Sumatran insect (*Mélanges exot.-entom.* xxv. p. 8, 1917).

Alphabetical numbered list of species enumerated in the present paper; those without bracketed generic initials belong to Carphurus, the others with the generic names abbreviated thus: B.=Brachyhedybius, C.=Choresine, Ch.=Carphuroides, and N.=Neocarphurus; the asterisk indicates that the species are described as new.

- advena (C.), 1.
- albipes, 38.
- *amboynensis, 20.
- *anamalaicus (Ch.), 1.
- *annulipes (N.), 1.
- *atricolor, 44.
- *basalis, 25.
- *basilanus, 15.
- *batchianus, 30.
- *bicolorata (C.), 2.
- *bivittatus, 16.
- *buruensis (C.), 3.
- *celebensis, 3.
- cinctipennis, 18.
- *dapitanus, 29.
- *dentaticornis, 13.
- *dentiger (Ch.), 3.
- *dichroma, 35.
- *diutus, 21.
- *dimidiatus, 37.
- dispar, 19.
- dohertyi, 12.
- *enganoensis, 45.
- *fasciatifrons, 11.
- *filicornis, 40.
- *laratensis, 8.
- *luciparens (Ch.), 9.
- *luteiventris (Ch.), 8.
- *luzonicus, 47.
- malaccanus, 26.
- *matanganus, 43.
- *molliculus, 33.
- *moluccana (C.), 4.
- *muiri, 17.
- nigrinus, 41.
- *nigritulus, 27.
- *nigroviolacea (C.), 5¹.
- *nilgiriensis (Ch.), 5.
- *nitidulus (Ch.), 6.
- *nodicornis, 49.
- *pallidulus, 10.
- *papuanus, 50.
- pectinatus (Ch.), 2.
- *pengaronæ, 6.
- *philippinus, 23.
- picipennis (Ch.), 10.
- *pilicornis, 31.
- plagiatus (Ch.), 4.
- plicaticollis, 1.
- *rastratus, 2.
- rouyeri, 46.
- rubroannulatus, 14.
- ruficeps, 5.
- *sayeri, 7.
- *scabridus, 39.
- *scutatus, 48.
- sinuatus (B.), 1.
- *stenoderus (N.), 2.
- *subluteolus, 34.
- sumatrensis, 22.
- *tener, 32.
- testaceicolor, 9.
- *timorensis, 36.
- *tondanus, 28.
- *translucens (Ch.), 7.
- transparipennis, 24.
- *wallacei, 4.
- *zeylanicus, 42.

SYNONYMS, VARIETIES, ETC.

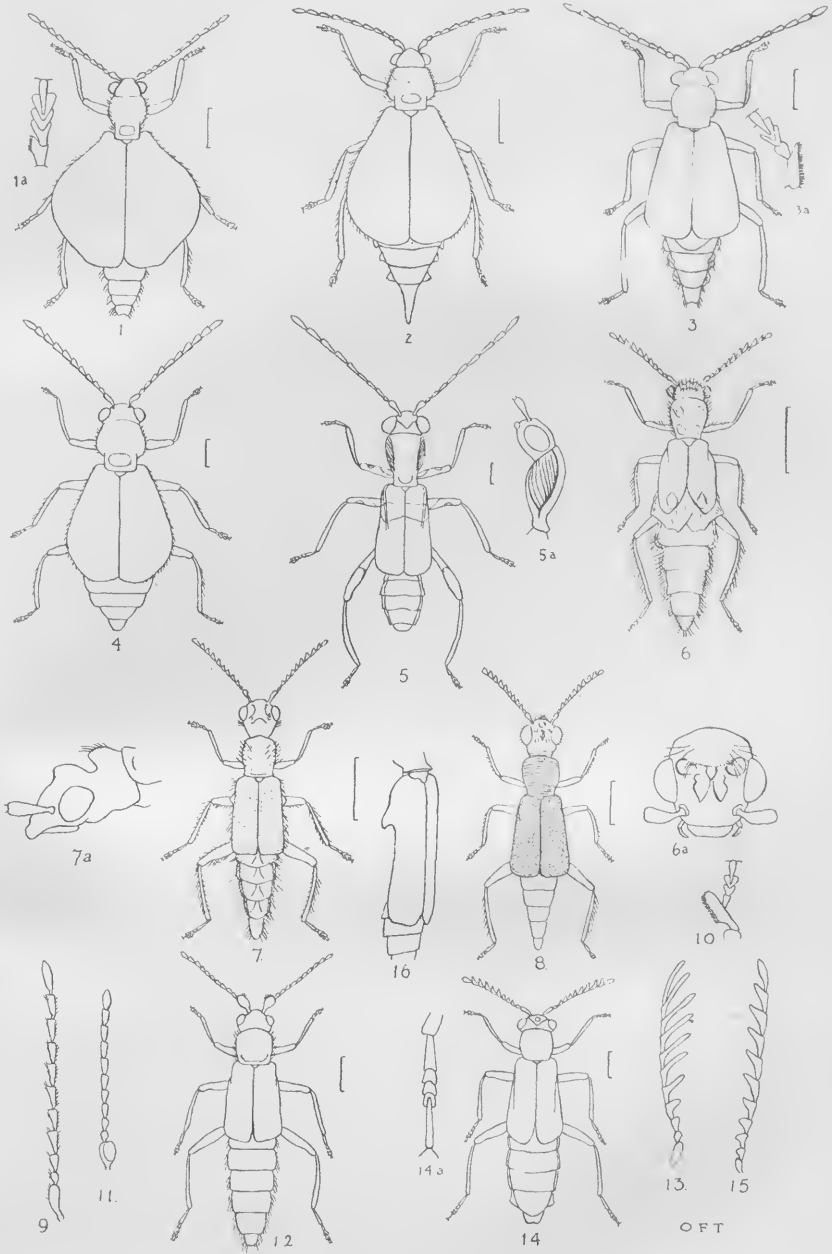
- apicalis, 13.
- astruci (Ch.), 2.
- atromaculatus, 14.
- ? bipartitus, 24.
- curdaiensis, 1.
- cyaneipennis, 2.
- ? discoidalis, 46.
- diversipennis, 14.
- notaticollis, 1.
- obscurior, 46.
- rufithorax, 1.
- ? tonkineus, 14.
- variiventris, 14.

Species recorded from the same regions not identified or wanting in the collections examined.

- Balanophorus humeralis*, Pic (1917), Banguey I.
 „ *javanus*, Pic (1906), Java.
 „ *macassarensis*, Pic (1917), Macassar.
Carphuromorphus validicornis, Pic (1917), Ké I.
Carphurus albonotatus, Pic (1922), Java.
 „ *birmanicus*, Pic (1918), Burma.
 „ *explanatus*, Pic (1922), Tonkin.
 „ *hæmorrhoidalis*, Motsch. (1859), Ceylon.
 „ *homalioides*, Bourg. (1890), Cambodia.
 „ „ Pic (1917), Sumatra.
 „ *limbifer*, Motsch. (1854), Ind. Or.
 „ *luteolus*, Er. (1840), Bintam I.
 „ *lutunganus*, Pic (1917), Lutungan I.
 „ *madurensis*, Pic (1921), Madura [? Java or India].
 „ *niasensis*, Pic (1917), Nias I.
 „ *nigripennis*, Motsch. (1854), Ind. Or.
 „ *nigroabdominalis*, Pic (1917), Banguey I.
 „ *reflexicollis*, Pic (1917), Banguey I.
 „ *rubriventris*, Motsch. (1859), Ind. Or.
 „ *rufifrons*, Pic (1921), Formosa.
 „ *rufonotaticeps*, Pic (1917), Celebes.
 „ *serricornis*, Fairm. (1883), New Britain.
 „ *subcæruleipennis*, Pic (1917), Sumatra.
Helcogaster impressiceps, Pic (1917), Ké I.
Microcarphurus atriventris, Pic (1921), Sumatra.
 „ *borneensis*, Pic (1917), Borneo.
 „ *brunneiventris*, Pic (1917), Aru I.

EXPLANATION OF PLATE I.

- Fig. 1.* *Choresine advena*, Pasc., ♂; 1 *a*, anterior tarsus.
Fig. 2. „ „ „ ♀.
Fig. 3. „ *bicolorata*, sp. n., ♂; 3 *a*, anterior tarsus.
Fig. 4. „ *moluccana*, sp. n., ♀.
Fig. 5. *Neocarphurus annulipes*, sp. n., ♂; 5 *a*, profile of head and prothorax.
Fig. 6. *Brachyhedybius sinuatus*, Pic, ♂; 6 *a*, head from in front.
Fig. 7. *Carphurus laratensis*, sp. n., ♂; 7 *a*, head in profile.
Fig. 8. „ *rastratus*, sp. n., ♂.
Fig. 9. „ *pilicornis*, ♂, antenna.
Fig. 10. „ *rouyeri*, Pic, ♂, anterior tarsus.
Fig. 11. „ *nodicornis*, sp. n., ♂, antenna.
Fig. 12. „ *papuanus*, sp. n., ♂.
Fig. 13. *Carphuroides anamalaicus*, ♂, antenna.
Fig. 14. „ *pectinatus*, Sharp, ♂; 14 *a*, posterior tarsus.
Fig. 15. „ *dentiger*, sp. n., ♂, antenna.
Fig. 16. *Carphurus muiri*, sp. n., ♂, elytra in profile.



MALAYAN AND INDIAN CARPHURINÆ.

SOME PSOCOPTERA FROM THE NEW HEBRIDES.

BY J. V. PEARMAN, F.E.S.

Reprinted from 'The Entomologist's Monthly Magazine,' Vol. lxiv.

During his visit to the New Hebrides in 1927, under the Percy Sladen Trust, Dr. J. R. Baker (of the Department of Zoology and Comparative Anatomy at Oxford) managed to secure a few Psocids. Hitherto no representatives of the Psocoptera have been recorded from that locality, although several species have been described from Fiji and from the Bismarck Archipelago. There was a scarcity of Psocids in the area investigated, hence the material is slight. Nevertheless it contains some interesting forms, including two not previously described, and I desire to record my thanks to Dr. Baker for the opportunity of examining them.

The specimens obtained represent the following:—

1. *Liposcelis bakeri* n.sp.
2. *Nanopsocus oceanicus* n.g., n.sp.
3. *Caecilius* ———? sp. (nymph).
4. ——— ———? gen. et sp. (nymph).

1. *Liposcelis bakeri* n.sp. (Fig. 1, 2).

Colour (in alcohol) pale yellowish grey, with the following parts darker, brownish grey: clypeus, frons, thorax, six broad bands on the abdomen bordering the posterior margins of the third and fourth tergites, and the anterior margins of the sixth, seventh, eighth and ninth tergites, and the apex.

Of the usual *Liposcelid* facies. Eyes with eight ommatidia. Mouth parts as in *L. divinatorius* (Mull.). Hind femora with the sub-basal external projection bold but blunt. At each external lateral angle of the prothorax are two long bristles. Prothoracic sternite with four bristles; sternite of meso- meta-thorax with a row of nine bristles (fig. 2). The bristles at the lateral angles of the pronotum, and at the shoulders of the mesonotum, are rather stronger and much longer than in *L. divinatorius* (relatively $1\frac{1}{2} : 1$), but the anal bristles are shorter (relatively $2 : 2\frac{1}{2}$). The epidermal sculpture, both the shagreening and the reticulation, is rather coarser than in *L. divinatorius*.

Length 1.25 mm.

NEW HEBRIDES: Espiritu Santo, Hog Harbour, in camp, 9th March 1927. One ♀.

Type in Hope Collection, Oxford University Museum.

I have much pleasure in dedicating this striking species to its discoverer.

2. *NANOPSOCUS* n.g.

Type *N. oceanicus* n.sp.

Genus of the sub-fam. Pachytroctinae, fam. Liposcelidae.

Imagines totally apterous. Eyes set at extreme hind angles of head, slightly overreaching hind head margin. Ocelli nil. Antennae probably 15-segmented (defective), flagellar segments 6 and 7 broadly annulated. 'Pick' apparently bifid, actually tridentate. Mouth parts otherwise as in *Liposcelis*. Prothorax well developed, without notal divisions; mesonotum and metanotum distinctly

demarcated. Femora of first pair of legs enlarged; tibiae of all legs each with two apical spurs; claw with a pre-apical tooth. Abdomen oval, plump. Ciliation sparse; on body arranged in isolated rows.

I have felt some reluctance in proposing yet another genus in this small sub-family of insufficiently-known insects, but the present species presents points of divergence from each of the defined genera types. In the form of the pick and the position of the eyes it partakes the characters on which the genus *Psacadium* Endl. 1908 was separated from *Pachytroctes* Endl. 1905, but it differs from the types of both those genera, particularly in the distinctive body ciliation, agreeing in this respect, however, with the South African *Pachytroctes brunneus* Rib. 1911, which species may prove to be congeneric with that from the New Hebrides. Indeed it was the occurrence of two distinct species with a well-marked common peculiarity that suggested a generic significance for that characteristic. Only by a critical comparison of a longer series of forms than is at present known of these retrograde Psocids can the validity of all the genera be tested. Hence I have given a description as detailed as the material at my disposal permits. Meanwhile the genera may be distinguished thus:—

1. Eyes with groups of minute rods between the facets ... *Peritroctes* Rib. 1911.
Eyes wholly bare 2.
2. Eyes posteriorly not quite reaching hind head margin; Pick distinctly tridentate *Pachytroctes* Endl. 1905.
Eyes more or less overreaching hind head margin; Pick apparently bifid . 3.
3. Abdominal ciliation fine and generally distributed *Psacadium* Endl. 1908.
Abdominal ciliation strong, arranged in isolated rows *Nanopsocus* nov.

Nanopsocus oceanicus n.sp. (fig. 3-9).

♂. Colour (in alcohol) light yellow; clypeus, pronotum, and metanotum rather darker; palpi, basal joints of antennae, mesonotum, and legs paler. Anterior margins of abdominal tergites 4-8 narrowly bordered brown, except at the sides.

Head, including eyes, sub-triangular, lateral contour curved, hind margin weakly convex, vertex suture reduced to a very short median notch, frontal suture not visible. Upper surface with scattered fine hairs, of which a few near the antennal sockets and one at the posterior margin of each eye are noticeably longer. Eyes of many bold facets, large, hemispherical, slightly overhanging hind head margin. Ocelli nil. Antennae (fig. 6) defective (wanting from the seventh flagellar segment), basal segments of usual form; flagellar segments narrowly cylindrical, width of first two about a third that of the basal segments, remainder still narrower. The whole antenna beset with microscopically fine hairlets which are shortest on the basal segments and increase in length progressively on succeeding segments; the hairlets apparently arranged in whorls, but so closely placed that there is no distinct appearance of rings until the fifth flagellar and following segments, where the whorls are visibly separated; in addition the apex of the fifth, and the whole of the sixth and seventh (flagellar) segments exhibit broad, though faint, annulations. Besides the microscopic pubescence the two basal segments bear a few cilia, their length

rather less than the width of the segments, and the flagellar segments have a few long cilia near their apices and a row of three or four in their length; on the first three segments of the flagellum the serial cilia are setaceous and set on the upper side, on the remaining segments they are finer and transferred to the lower side. Towards the apex of each, the third and sixth flagellar segments have a short, stout spine, sharply bent forward near the seat of insertion. *Clypeus* small but prominent, with a few cilia. *Maxillary palpi* of four segments in the usual proportions, the distal segment long oval, its tip narrowly rounded; the whole with microscopic pubescence and a few longish cilia; no sensory spine visible on the second segment. *Pick* with the median tooth reduced and minute, the two lateral teeth long and slender, unequal. *Mandibles* and labium much as in *Liposcelis* (figs. 8, 9).

Prothorax transversely oblong, about as wide as head between eyes, and without visible divisions. Meso- and metathorax sub-equal, scarcely narrower than prothorax, apparently amalgamated, but the tergites distinctly defined. A few cilia occur on the thorax, distributed as in fig. 3.

Legs moderately long, slender; femora of first pair much, of others slightly enlarged; tibiae rather longer than femora; tarsi of three segments, together five-sixths the length of their respective tibiae; basal segment of tarsus of fore and mid legs about as long as the other two segments together, of hind legs twice as long (hind tarsal ratios $4\frac{1}{2} : 1 : 1\frac{1}{4}$); claw slender, weakly curved, with a pre-apical tooth. Tibiae and tarsi with microscopic pubescence (finer than on antennae); femora, tibiae and tarsi with a few fine bristly cilia; all tibiae with two apical spurs, one rather stronger than its fellow.

Abdomen with nine visible tergites; first segment narrower than, and partly concealed by, metathorax, somewhat fleshy, with a short seta each side; other segments of normal annular form; tergites 2-8 each with a single row of spaced setae inserted between the mid-line and the posterior margin, tergite 9 with a similar row anterior to the middle and a group of setae near the caudal margin. Hind margin of last tergite produced medially into two papillar processes, each furnished apically with a long bristle (fig. 4). Dorsal telson flap with two pairs of upstanding bristles on the disc, lateral telson flaps ciliated but without anal spines or sensory areas.

Epidermal sculpture of upperside of head a fine shagreen, of abdominal tergites a transverse irregular reticulation.

The copulatory apparatus has been extruded from the abdomen. As seen from above (fig. 5), a large, colourless, fleshy sac (presumably the swollen fused bases of the seminal vesicles) bears medially a simple rod-like penis, flanked, below, by a pair of short, curved, pointed, lamellar appendages. Beneath the sac, at either side, a long fusiform clasper, apically pointed and incurved, is articulated to a series of longitudinally disposed muscles.

Length of insect 1.04 mm.

Nymph (late instar) (fig. 7).

Colour pale yellowish with black eyes.

Antennae with the two first flagellar segments weakly curved, the long cilia disposed as in the imago, the sensory spines not distinguishable. Tarsi of two sub-equal segments. Meso- and metathorax each bearing a pair of tiny rudimentary wing pads. Last abdominal tergite simple. Otherwise as in imago.

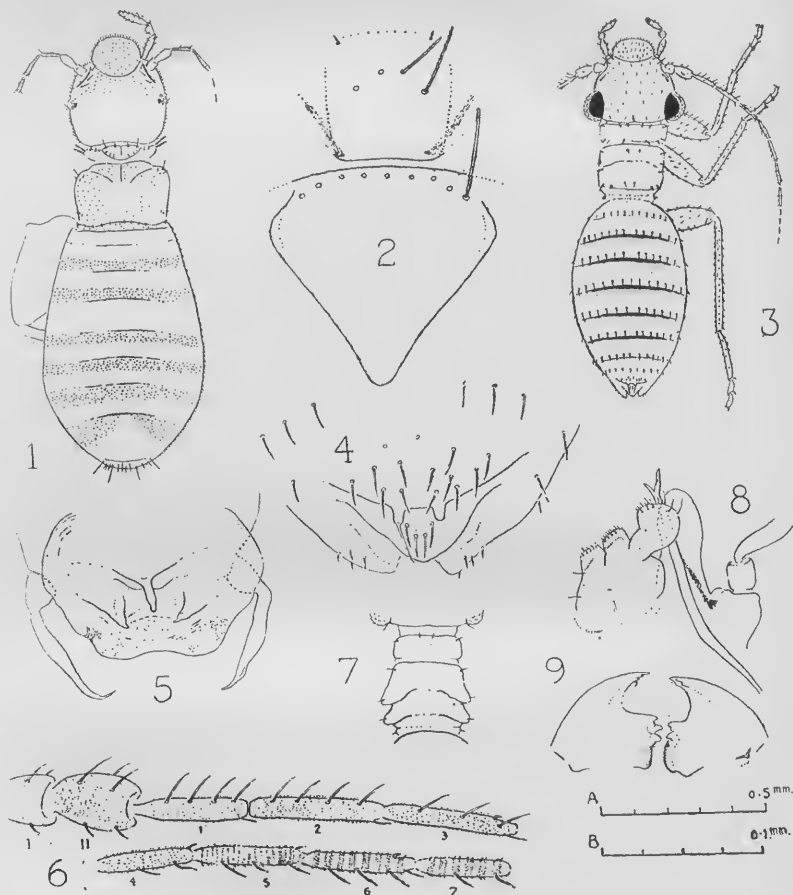
Length 0.95 mm.

♀. A female of this species was unfortunately lost in the course of preparation for mounting. It had large eyes produced hindwardly even more than in the male. No other structural details were noted. Length 1.3 mm.

NEW HEBRIDES : Espiritu Santo, Hog Harbour, in camp. 8th February 1927. One ♂, one ♀, four nymphs.

Type ♂ and nymph in Hope Collection, Oxford University Museum.

The processes of the last abdominal tergite of the male are probably peculiar to that sex, functioning as tactile sensory organs accessory to copulation. Antennal sensory spines were found by



EXPLANATION OF FIGURES.

Fig. 1. *Liposcelis bakeri*, ♀; 2. Same, thoracic sternites; 3. *Nanopsocus oceanicus* ♂; 4. Same, apex of abdomen, above; 5. Same, ♂ genitalia, dorsal aspect; 6. Same, antenna (nine segments); 7. Same, thorax of nymph; 8. Same, labium and maxilla (nymph), from below; 9. Same, mandibles (nymph) from above.

Scales.—A. Figs 1 and 3 (fig. 7 slightly more enlarged); B. figs. 2, 4-6, 8, 9.

Ribaga on the distal segments of the flagellum in *Dorypteryx albicans* Rib. 1907, and recently such spines somewhat resembling those of the present insect have been detected by Womersley in the *Campodeidae* (E.M.M. 1928, lxiv, p. 65). Of phylogenetic interest is the occurrence of wing rudiments in the nymph, a phenomenon only once previously recorded in connection with an apterous Psocid (*Hyperetes britannicus* Harrison, 1916).

This species is distinguishable from all other described members of the sub-family, except *Pachytroctes brunneus* Rib., by the body ciliation, and from the named species by the colour and, apparently, by the relatively larger eyes.

3. *Caecilius* ———? sp.

One nymph in the last instar of a yellowish species with black eyes.

Length (in alcohol) 1.72 mm.

NEW HEBRIDES : Espiritu Santo, Hog Harbour, 23rd May 1927.

4. ——— ———? gen. et sp.

A last instar nymph of a winged species, its relationship not certainly determinable. It has somewhat the facies of an *Ectopsocus*, but differs in several respects from the representatives of that genus. The tarsal structure suggests Caeciliid affinities. Colour brownish, hirsute.

Length 1.37 mm.

NEW HEBRIDES : Espiritu Santo, Hog Harbour, 9th March 1927.

9 West Mall, Clifton, Bristol.

March 1928.

XXI. *Contribution à la Faune des Orthoptères des Nouvelles-Hébrides.* Par C. WILLEMSE, Eygelshoven, Hollande. Avec une introduction de JOHN R. BAKER. Communicated by Prof. E. B. POULTON, F.R.S.

[Read October 21st, 1925.]

PLATE LI, AND FIVE TEXT-FIGURES.

INTRODUCTION.

EN introduisant l'article de Mons. C. Willemse concernant les Orthoptères que j'ai collectionnés aux Nouvelles-Hébrides, je désire avant tout exprimer mes remerciements aux Trustees of the Percy Sladen Memorial Fund qui m'ont procuré les moyens pécuniaires de mon voyage d'études.

Je suis également l'obligé de Mons. le Professeur E. B. Poulton qui m'a aidé tant qu'il lui était possible, non seulement pour la collection d'Orthoptères, mais également pour celle d'autres groupes d'insectes, en surveillant leur conservation, le libelllement des localités d'origine et la distribution aux autorités compétentes pour la détermination et les descriptions.

Je n'oublie pas non plus Mons. et Mdme. Anderson qui m'ont si largement offert une généreuse hospitalité pendant mon séjour à l'Ile de Espiritu-Santo.

Les Nouvelles-Hébrides forment une groupe de petites îles montagneuses à l'ouest de l'Océan Pacifique, à l'est de la Nouvelle-Calédonie et à l'ouest de l'île Fidji.

Les montagnes sont en tuf volcanique et en corail sur-élevé.

Le climat y est tropical et les pluies abondantes (environ 170 inches par an sur une île où elle a été mesurée).

Il n'y a que peu de différence entre la saison chaude avec beaucoup de pluie et la saison moins chaude avec peu de pluie.

La végétation luxuriante forme des forêts impénétrables de petits arbres, principalement.

TRANS. ENT. SOC. LOND. 1925.—PARTS III, IV. (FEB. '26)

Les espaces dénués d'arbres se présentent seulement dans les parties cultivées des îles.

La collection a été formée en la saison chaude 1922-23.

PRÉFACE.

La connaissance de la faune orthoptérologique des Nouvelles-Hébrides a été enrichie ces dernières années par le résultat des explorations de MM. les Drs. F. Sarasin et J. Roux, publié dans la "Nova Caledonia." *

Par les recherches de Mons. J. R. Baker, spécialement dans les Nouvelles-Hébrides, la connaissance a été augmentée et la collection comprend 83 exemplaires représentant 22 genres et 27 espèces, parmi lesquelles se trouvent un nouveau genre et 6 nouvelles espèces.

Je tiens à exprimer mes remerciements à Mons. le Prof. E. B. Poulton pour l'amabilité qu'il a eue en me confiant l'étude de cette collection et de même à Mons. B. P. Uvarov qui avait déjà déterminé une partie et particulièrement à Mons. L. Chopard qui a eu la bonté de déterminer et de reviser les Gryllides.

Fam. MANTIDAE.

Sous-fam. *MANTINAE*.

Tenodera australasiae Leach.

Localité : New Hebrides, Efate Island, Dec. 1922; Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 16, 1923, 1 ♂.

Statilia apicalis Saussure.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 18, 1923, 1 ♀.

* *A. Griffini* : Stenopelmaticidae della Nuova Caledonia, 1914.

H. Karny : Conocephalidae Neucaledoniens und der Loyalty Inseln, 1914.

L. Chopard : Gryllidae de la Nouvelle-Calédonie et des Iles Loyalty, 1915.

C. Willemse : Locustidae (Acridiidae a-a-) et Phasgonuridae (Locustidae a-a) de la Nouvelle-Calédonie et des Iles Loyalty, 1923.

L. Chopard : Blattidae de la Nouvelle-Calédonie et des Iles Loyalty, 1924.

Couleur du corps brun (verdâtre?). Les taches sous les hanches et fémurs antérieurs sont vertes ayant un éclat métallique.

Longueur du corps	.	.	.	.	.	35 mm.
„ du prothorax	.	.	.	.	.	12 „
Largeur du pronotum	.	.	.	.	.	3 „
Longueur de l'élytre	.	.	.	.	.	26 „
„ de l'aile	.	.	.	.	.	25 „ *

Fam. PHASGONURIDAE.

Sous-fam. COPIPHORINAE.

Euconocephalus extensor Walker (= australis Bol.).

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 10, 1923, 2 ♂♂. Pl. LI, fig. 1.

Longueur du corps	.	.	.	.	.	36 mm.
„ du fastig. vertic.	.	.	.	.	.	2.5 „
„ du pronotum	.	.	.	.	.	9 „
„ de l'élytre	.	.	.	.	.	41.5 „
„ du fémur postérieur	.	.	.	.	.	23 „

Sous-fam. CONOCEPHALINAE.

Xiphidion affine Redt.

Localité : New Hebrides, Espir.-Santo Isl. (Chuuri,† 1000–2000 ft.; Hog Harbour, open forest), Jan. 7–25, 1923, 6 ♂♂, 4 ♀♀.

Xiphidion laetum Redt.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings; Chuuri), Jan. 1923, 1 ♂, 1 ♀.

Xiphidion geniculare Redt.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 9, 1923, 1 ♂; idem (open forest), Jan. 7, 1923, 1 ♀.

Sous-fam. LISTROSCELINAE.

Phisis listeri Kirby.

Localité : New Hebrides, Jan. 23, 1923, 0–500 ft., Espir.-Santo Isl., 1 ♂; idem, Jan. 22, 1923, 1 ♀, Espir.-Santo Isl. (Shark Bay, clearings).

* Saussure indique la longueur de l'aile chez le ♂ comme 1.3. Ce doit être une erreur.

† Chuuri is a village in the centre of the island.—J. R. B.

Cette espèce est voisine à *Ph. pectinata* Guérin, mais en diffère par les bords jaunes du pronotum et l'oviscapte qui est plus petite.

En voici les dimensions :—

	♂.	♀.
Longueur du corps . . .	13 mm.	14 mm.
„ du pronotum . . .	3 „	3.5 „
„ de l'élytre . . .	20 „	20.5 „
„ du fémur antér. . .	5.5 „	5 „
„ du fémur postér. . .	—	11.5 „
„ du tibia antér. . .	5.5 „	5.5 „
„ de l'oviscapte . . .	—	9 „

Le nombre des épines aux pattes antérieures et intermédiaires est comme suit :—

	♂.	♀.
Fémur antérieur face interne . . .	4	5
„ „ „ externe . . .	6	6
„ intermédiaire face interne . . .	0	0
„ „ „ externe . . .	4	3
Tibia antérieur face interne . . .	7	6
„ „ „ externe . . .	7	7
„ intermédiaire face interne . . .	6	6
„ „ „ externe . . .	6	5

Dans la collection se trouve aussi un ♂ larve de *Phisis*, du même endroit (Esp.-Santo I. (Hog Harbour, clearings), Jan. 11, 1923), qui appartient probablement à la même espèce.

Sous-fam. *AGRAECIINAE*.

***Salomona magnifica* nov. sp.**

La couleur générale est d'un brun noirâtre avec des parties jaunes.

La tête est un peu moins large près des yeux que près des mandibules.

L'éperon frontal est assez grand, il n'atteint pas la hauteur du premier article des antennes, il est acuminé à l'extrémité, et offre en dessus à la base un petit tubercule, en dessous dans le midi un grand tubercule plus ou moins arrondi.

Le front est rugueux en avant, mais moins sur les joues; là, on peut distinguer des saillies; une crête un peu confuse part de l'œil, se bifurquant au milieu de la joue, et les deux branches ainsi formées atteignent, l'une l'angle antérieur, l'autre l'angle postérieur des mandibules. Derrière cette crête on aperçoit encore une branche, mais plus faible, sortant de l'œil et se réunissant avec la branche postérieure.

La partie postérieure des joues est à peu près lisse.

La tête est d'un brun jaunâtre, le vertex noir, sauf une tache centrale parfois composée de 3-4 petites taches, jaune.

L'éperon frontal, ainsi que les deux premiers articles des antennes, une ligne autour des yeux, réunies sur le front sont noirs.

De cette ligne sort une tache quadrangulaire noire sur le front parfois se terminant en deux lignes noires.

Le front d'un brun jaunâtre ou rougeâtre, les joues plus claires; la partie inférieure du front noire; le clypeus jaune, les mandibules puissantes et noires, les mâchoires, le labium sauf la partie supérieure qui est noire, les palpes maxillaires et labiaux sont jaunâtres.

Les antennes sont d'un jaune pâle, sauf les deux premiers articles qui sont d'un noir brillant.

Toutes les pièces sternales sont d'un brun noir.

Le pronotum, tronqué et peu prolongé en arrière, offre de grosses ponctuations sur toute la surface, sauf au milieu, sur une tache longitudinale lisse et jaunâtre et sur deux grosses saillies latérales et irrégulières qui sont jaunâtres et striées finement longitudinalement. Le pronotum est partout ailleurs d'un brun-noir brillant.

Les élytres sont d'un brun pâle, avec les veines et nervures d'un joli vert ou plutôt brun, avec des petites taches brunes peu nombreuses et irrégulièrement disposées sur la surface.

Les ailes presque incolores ou légèrement enfumées.

Les pattes d'un brun-noir, les hanches avec une tache jaunâtre, les fémurs sur la face interne avec une coloration jaunâtre surtout à la base; les tibias d'un brun-noir, plus pâles à l'extrémité, les tarses jaunâtres, l'insertion des articles noire.

L'abdomen est d'un brun pâle, et les stigmates sont d'un brun foncé.

La carène interne du fémur postérieur est sans épines.

♂. Le dernier segment dorsal est échancré au milieu et déprimé, avec les lobes arrondis.

Les cerci sont épais, recourbés en dedans à l'extrémité, presque cylindriques à apex obtus, présentant à la base à la face interne un lobe assez large plus ou moins carré et tronqué.

La plaque sous-génitale assez longue, offrant une incision triangulaire portant des stylets de longueur moyenne.

♀. Les cerci courbés régulièrement et plus ou moins croisés, l'apex arrondi.

L'oviscapte courbé régulièrement, falciforme, brun-noirâtre.

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La plaque sous-génitale courte, montrant au sommet deux lobes.

	♂.	♀.
Longueur du corps . . .	54 mm.	52-56 mm.
„ du pronotum . . .	13 „	12-13 „
„ de l'élytre . . .	37.5 „	43-44 „
„ du fémur postér. . .	20 „	23 „
„ de l'oviscapte . . .	. . .	19 „

Localité : New Hebrides, Espir.-Santo Isl. (open forest), Jan. 8, 1923, 1 ♂ (type); idem 1 ♀; Elephant Isl. (open forest), Jan. 12, 1923, 1 ♀. Pl. LI, fig. 2, text-fig. 1.

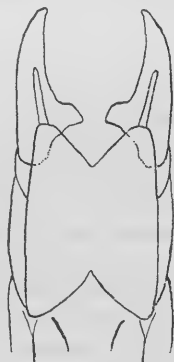


FIG. 1.—*Salomona magnifica* nov. sp. ♂.

Plaque sous-génitale et cerci en dessous.

Cette espèce vient se placer près de *laticeps* de Haan, dont elle diffère par la coloration de la tête qui chez *laticeps* est tout à fait noire excepté le clypeus et labrum.

Fam. GRYLLACRIDAE.

Gryllacris punctipennis Walker.

Localité : New Hebrides, Espir.-Santo Isl. (Shark Bay, clearings), 1923, 1 ♂, 2 ♀♀. Pl. LI, fig. 4.

Gryllacris poultoni * nov. sp.

Corps assez robuste, de taille moyenne. Couleur du corps brun-jaunâtre.

* En honneur de Mons. le Prof. E. B. Poulton, le célèbre entomologiste de l'université d'Oxford. Ne pas confondre avec le *Gryl. poultoniana* Griff.

Le vertex avec un demi-cercle noirâtre autour de chaque œil et quelques petites taches brun-foncées.

Fastigium verticis plus large que le 1^{er} article de l'antenne, avec des lignes noirâtres dans le milieu, étant le bout des demi-cercles.

Les taches ocellaires rougeâtres, la tache frontale ovale.

Entre les antennes avec 2 petites taches noires.

Front avec une ligne brun-foncée diagonale, au-dessous de l'insertion de l'antenne, et avec un point noir à chaque côté.

Le clypeus avec quelques points foncés.

Les mandibules brun-rougeâtres, le bord interne noirâtre.

Pronotum brun-jaunâtre avec quelques points et lignes brun-foncés comme indique la figure, le bord antérieur dans son milieu avancé et arrondi, rougeâtre ou plus clair, le reste du bord antérieur, le bord inférieur et le bord postérieur noirâtres ou brun-foncés.

L'angle antérieur du lobe réfléchi arrondi, l'angle postérieur sinueusement arrondi.

Les élytres atteignent le bout de l'abdomen, les ailes un peu plus longues.

Élytres subhyalines, les nervures d'un brun léger, les cellules, surtout de la partie postérieure, brun-foncées, formant un contraste distinct avec les nervures.

La nervation d'après le type III *b* (Karny).

Nervure radiale libre, ramifiée, le secteur rad. sc détachant dès le milieu, celui-ci près de l'apex une fois ramifié.

Nervure médiane simple, non confondue avec les autres.

Nervure cubitale ramifiée deux fois, dans le tiers basilaire et dès son milieu.

Les six nervures anales simples.

Aile de forme triangulaire, hyaline, avec 5-6 bandes brunes irrégulières et incomplètes, parallèles au bord postérieur, les nervures de coloration brun-léger, les bandes situées dans les cellules de sorte que les nervures sont bordées d'une zone hyaline.

Les pattes brun-jaunâtres, les fémurs en dessous d'un bleu acier.

Fémur postérieur à son bord inférieur externe avec 9 épines, à son bord inférieur interne avec 7-8 épines, bleu acier.

Les tibias antérieurs et intermédiaires avec une double rangée de 4 épines mobiles, d'une même couleur que le tibia.

Tibia postérieur avec 8 épines au bord interne et 8 épines au bord externe. Les épines à l'apex plus foncées.

Les tergites brun-foncés, luisants, les sternites brun-jaunâtres.

Oviscapte falciforme, brun. Plaque sous-génitale à bord postérieur simplement arrondi.

	♀.
Longueur du corps	27 mm.
„ du pronotum	5.5 „
„ de l'élytre	18 „
Latitude de l'élytre	7.5 „
Longueur du fémur ant.	8 „
„ du fémur post.	12.5 „
„ de l'oviscapte	12 „

Localité : New Hebrides, Espir.-Santo Isl., Elephant Isl. (open forest 0-100 ft.), Jan. 12, 1923, 1 ♀ type. Pl. LI, fig. 3.

Fam. GRYLLIDAE.

Sous-fam. GRYLLINAE.

Gryllus oceanicus Le Guillon.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 1923, 1 ♂.

Mons. L. Chopard m'écrit * : "*Gryllus oceanicus* Le Guillon, c'est l'espèce que j'ai signalée déjà des N^{les} Hébrides sous le nom de *Gr. commodus* Walk. (Nova Caledonia, II. 8, p. 166)."

Sous-fam. TRIGONIDIINAE.

Metioche flavipes Sauss.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 5, 1923, 1 ♂; Efate Isl. (Vila, clearings), Dec. 1922, 1 ♂, 3 ♀♀; idem (Meli, Nat. Gardens), Dec. 14, 1922, 1 ♀.

Mons. L. Chopard m'écrit : "*Metioche flavipes* Sauss. est, à mon avis, la forme brachyptère de *M. vittaticollis* Stål."

Paratrigonidium fuscocinctum Chopard.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 9, 1923, 1 ♂, 1 ♀; Efate Isl. (Vila, clearings), Dec. 22, 1922, 1 ♂; Banks Isl. (Gaua, Nombu, dense forest), Nov. 18, 1922, 1 ♀.

Mons. L. Chopard m'écrit : "*Paratrigonidium fuscocinctum* Chop., espèce de Java dont la description doit paraître dans "Treubia." Cette espèce se trouve aussi en Australie; les individus des N^{les} Hébrides diffèrent du type par des antennes plus noires, mais cette différence ne me paraît pas spécifique."

* La lettre est datée 19 Mars 1925.

Sous-fam. *ENEOPTERINAE*.

Cardiodactylus novae-guineae de Haan.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 9, 1923, 1 ♂, 2 ♀♀ et 2 larves.

Cardiodactylus pictus Sauss.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 5, 1923, 1 ♀.

Podoscirtus chopardi * nov. sp.

♀. Forme assez large, couleur brune ou roussâtre, le pronotum avec des bandes et taches irrégulières plus foncées, qui me semblent être produites par la dessiccation.

Tête bombée en dessus, subglobuleuse, le front arrondi; rostre aussi large que le 1^{er} article des antennes, portant l'ocelle antérieur au fond d'une fossette, vers le milieu de sa longueur, muni de quelques soies.

Front court, un peu déprimé.

Yeux assez saillants en avant, ocelles petites.

Antennes brunâtres à 1^{er} article grand, arrondi.

Palpes assez longs; palpes maxillaires à article III, IV et V à peu près égaux, le dernier dilaté au sommet et tronqué obliquement, son bord supérieur arqué; palpes labiaux à article III dilatés à l'extrémité.

Pronotum distinctement transversal, à bord antérieur droit, bord postérieur subarcé, tous deux ciliés.

Disque avec une ligne médiane faiblement indiquée; lobes latéraux étroits, obliques, le bord antérieur droit et cilié.

Abdomen court, chez la ♀ le dernier tergite abdominal normal, plaque suranale fortement carénée latéralement et rétrécie au milieu, plaque sous-génitale longue, échancrée à l'apex.

Cerques de la longueur de l'oviscapte, avec des poils longs.

Oviscapte dans la moitié apicale courbé. Valves apicales brun-noirâtres; les supérieures dépassant les inférieures, ridées obliquement à la face externe et présentant en dessous à la base, deux dents arrondies; de ces dents jusqu'à l'extrémité trois rangées de petites lames aplaties plus ou moins denticulées; valves inférieures à bord inférieur avec 4 petites dents aiguës, l'apex pointu.

* En honneur de Mons. le Dr. L. Chopard, le savant connaisseur des Gryllides.

Pattes antérieures et intermédiaires fortes, velues; fémurs un peu comprimés, tibias à épines très courtes, les antérieurs portant un tambour interne ovale, et un externe ovale un peu plus petit.

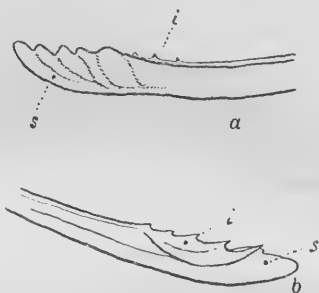


FIG. 2.—*Podoscirtus chopardi* nov. sp. ♀.

Extrémité de l'oviscapte.

a, face externe; *b*, face interne.

s = valve supérieure; *i* = valve inférieure.

Tarses courts; métatarse un peu plus long que le 2^e article, qui est déprimé, cordiforme; 3^e article un peu plus long que le métatarse, grêle.

Tarses intermédiaires et pattes postérieures manquants.

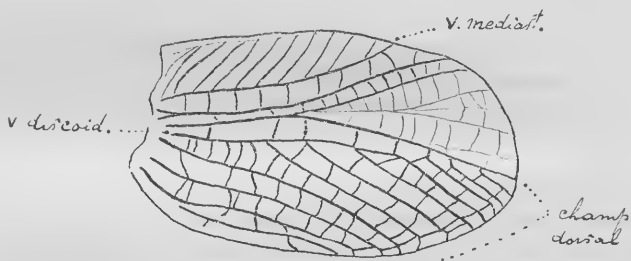


FIG. 3.—*Podoscirtus chopardi* nov. sp. ♀.

Élytre.

Élytres un peu plus longs que l'abdomen, jaune-brunâtres; champ dorsal présentant 4 nervures longitudinales et 4-5 branches à la discoïdale; nervures assez régulièrement espacées en carrés allongés; champ latéral assez large, présentant 2 nervures libres et 10-11 branches à la médiastine.

Ailes dépassant un peu les élytres.

Dimensions ; ♀.

Longueur du corps	12 mm.
„ „ avec élytres	15.5 „
„ „ avec ailes	15.7 „
„ du pronotum	3 „
„ du fém. ant.	5 „
„ du tib. ant.	4.5 „
„ du fém. interm.	4.5 „
„ du tib. interm.	4.5 „
„ du fém. post.	? „
„ du tib. post.	? „
„ de l'oviscapte	12 „

Cette espèce se distingue des autres par la forme un peu large, par le grand nombre de branches à la nervure médiastine et par la forme de l'oviscapte.

Localité : New Hebrides, Espir.-Santo Isl. (open forest near Hog Harbour), Jan. 8, 1923, 1 ♀ type. Text-figs. 2a, 2b, 3.

Aphonomorphus punctatus de Haan.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 9, 1923, 1 ♀.

Fam. PHASMIDAE.

Sous-fam. PHIBALOSOMINI.

Megaacrania bakeri * nov. sp.

♀. Verdâtre, varié de brun et de jaune. Occiput avec 4-5 lignes jaunâtres plus ou moins fort indiquées.

Les antennes brun-jaunâtres, à la base parfois verdâtres, l'apex un peu plus clair.

Mésnotum atténué postérieurement, la surface couverte de petites granulations ou tubercules peu nombreux, disposés plus ou moins en séries.

Le bord antérieur avec une dent à chaque côté.

Mésopleura et mésosternum lisse, ainsi que le métapleura et métasternum.

Élytres ovalaires, courts, dépassant peu la longueur du métathorax, bruns les nervures jaunâtres, à tubercule peu saillant.

Ailes beaucoup plus longues que les élytres, atteignant le bout

* En honneur de Mons. J. R. Baker, l'explorateur des Nouvelles-Hébrides.

du fémur postérieur, à champ antérieur brun à nervures jaunâtres; champ postérieur unicolore, presque incolore.

Abdomen brun-verdâtre, le bord postérieur des anneaux avec une bande assez large, brun-foncée.

Face inférieure du corps jaunâtre.

Le bord postérieur du segment anal simplement arrondi.

Cerci courts, aplatis, larges, à apex arrondis. Opercule atteignant le sommet des cerci, atténué et caréné dans son milieu. Pattes vertes.

Les carènes supérieures du fémur antérieur distinctement dentées. La carène médiane inférieure de tous les fémurs avec une rangée de 4-5 dents.

					♀.
Longueur du corps	.	.	.	.	108 mm.
„ de l'antenne	.	.	.	.	21 „
„ du mésonotum	.	.	.	.	16 „
„ du métanotum	.	.	.	.	11 „
„ du fémur antér.	.	.	.	.	25 „
„ du fémur interm.	.	.	.	.	15 „
„ du fémur postérieur	.	.	.	.	18 „
„ de l'opercule	.	.	.	.	17 „

Cette espèce vient se placer près de *M. alpheus* Westw. dont elle diffère par les carènes supérieures du fémur antérieur distinctement dentées.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 1923, 3 ♀♀, type et cotype, et une larve.

Sous-fam. *ACROPHYLLINI*.

Hermarchus novae-britanniae Wood-Mason.

					♂.
Longueur du corps	.	.	.	.	102 mm.
„ du mésonotum	.	.	.	.	20 „
„ du métanotum	.	.	.	.	12 „
„ de l'élytre	.	.	.	.	6.5 „
„ de l'aile	.	.	.	.	54 „
„ du fémur ant.	.	.	.	.	34 „
„ du fémur post.	.	.	.	.	29 „

L'exemplaire correspond assez bien avec la description que Redtenbacher (*Die Insektenfamilie der Phasmiden III*, 1908, p. 447) en donne. Puisque les ♂♂ de plusieurs espèces de *Hermarchus* ne sont pas connus, il est toujours difficile de les déterminer avec certitude.

La connaissance de plusieurs genres des Phasmiens, comme aussi de celui-ci, laisse encore beaucoup à désirer.

Localité : New Hebrides, Efate Isl. (Vila, clearings), Dec. 24, 1922, 1 ♂.

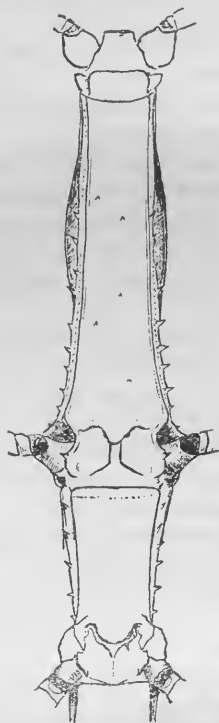


FIG. 4.—*Hermarchus uvarovi* nov. sp. ♀.
Més- et métasternum en dessous.

***Hermarchus uvarovi* * nov. sp.**

♀. Robuste, jaunâtre varié de brun.

Occiput lisse, avec quelques lignes longitudinales, impressées. Pronotum avec le sillon typique au milieu, le disque avec des lobes peu élevés.

Prosternum s'élargissant en arrière, le bord latéral avec une petite dent près du bord postérieur.

* En honneur de Mons. B. P. Uvarov, le célèbre orthoptérologiste du Mus. Nat. Hist. de London.

Mésonotum lisse, portant aucune dent, un peu renflé vers le tiers antérieur et atténué antérieurement dès le tiers antérieur.

Mésopleura avec une rangée de 8-9 dents bien indiquées dans la partie postérieure.

Mésosternum presque lisse, avec quelques denticules, irrégulièrement disposées.

Métanotum lisse. Métapleura avec une rangée de 4-6 dents assez grandes. Méta sternum lisse.

Abdomen lisse, atténué régulièrement vers le bout, les bords latéraux des segments non dilatés.

Le bord postérieur de la plaque suranale arrondi. Cerques courts, un peu comprimés et courbés, plus ou moins pointus au sommet.

Opercule très long, dépassant bien le bout de l'abdomen, tectiforme, atténué, subarrondi à l'apex.

Valvules de l'oviscapte dépassant le bout de l'opercule, filiformes.

Pattes fortes.

Fémurs antérieurs à carènes supérieures finement denticulées, les carènes inférieures fortement denticulées.

Les carènes du tibia antérieur finement denticulées, la carène inférieure, latérale, plus forte.

Les carènes des fémurs intermédiaires et postérieurs, ainsi que les tibias plus fortement denticulées, sauf les carènes supérieures des tibias qui sont finement denticulées.

La face inférieure des fémurs et tibias dans le milieu avec une rangée de dents plus ou moins fortes.

Métatarses denticulés.

	♀.
Longueur du corps	172 mm.
„ de l'antenne	60 „
„ du mésonotum	36 „
„ du métanotum	22 „
„ du fémur antér.	47 „
„ du fémur interm.	36 „
„ du fémur postérieur	40 „
„ de l'opercule	27 „

Localité : New Hebrides or Banks Island. Sept. 1922-Jan. 1923, 1 ♀ type. Text-fig. 4.

Cette espèce vient se placer près de *H. inermis* Redt. dont elle diffère par le mésopleura qui porte une rangée de grandes dents, tandis que dans *inermis* il porte des petits tubercules, et par les valvules de l'oviscapte qui dépassent bien l'opercule, tandis que dans *inermis* elles n'atteignent pas le bout de l'opercule.

Fam. ACRIDIIDAE.

Sous-fam. TETRIGINAE.

Paratettix variabilis Bol.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 18, 1923, 1 ♀; idem, Chuuri, 1000–2000 ft. Jan. 24–25, 1923, 2 ♀♀.

Sous-fam. TRUXALINAE.

Aeolopus dubia Will.

Localité : New Hebrides, Espir.-Santo Isl. (Shark Bay, clearings), Jan. 22, 1923, 1 ♀; Efate Isl., Dec. 1922, 1 ♀; idem (Vila, clearings), Dec. 18, 1922, 1 ♂.

Sous-fam. OEDIPODINAE.

Heteropternis obscurella Blanch.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 2, 1923, 1 ♀.

Sous-fam. CYRTACANTHACRINAE.

Oxya gavis Walk.

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 9, 1923, 3 ♂♂, 1 ♀; idem (open forest), 2 ♀♀; idem, Chuuri, 1000–2000 ft., Jan. 25, 1923, 2 ♀♀.

Austracris guttulosa Walk., subsp. *illepida* Walk.

Localité : New Hebrides, Efate Isl. (Vila, clearings), Dec. 21, 1922, 1 ♂; Espir.-Santo Isl. (open forest near Hog Harbour), Jan. 8, 1923, 1 ♂; idem (Hog Harbour, clearings), Jan. 19, 1923, 2 ♂♂; idem (Shark Bay, clearings), Jan. 22, 1923, 1 ♂; Banks Isl., 2 ♀♀.

HEBRIDEA nov. gen.

Corps étroit, allongé, ponctué rugueusement. Fastig. vertic. avancé horizontalement en avant des yeux, le bord antérieur arrondi, le bord latéral sub-parallel, avec une petite carène médiane. Le front fortement déclive, la carène frontale à peine indiquée, ainsi

que les carènes latérales. Les yeux ovales, assez saillants. Les antennes plus longues que la tête et le pronotum, réunies, filiformes.

Pronotum presque cylindrique, un peu élargi postérieurement, rugueux, le bord antérieur et postérieur arrondi, carènes médiane et latérales nulles, avec une faible indication de sillons transversaux, le sillon typique situé bien loin après le milieu.

Le bord inférieur du lobe réfléchi subanguleux, angle antérieur subaigu, angle postérieur arrondi.

Les organes du vol plus ou moins rudimentaires, abrégés.

L'élytre atteignant le bout du 3^e segment abdominal, acuminé à l'apex arrondi; la vénulation rudimentaire.

L'aile presque aussi longue que l'élytre, rudimentaire, de forme normale.

Le tubercule prosternal en forme de lame transversale, comprimé d'avant en arrière, l'apex tronqué, avec un petit tubercule obtus aux coins.

L'espace mésosternal étroit, en forme de X, le bord intérieur du lobe mésosternal arrondi.

Les lobes métasternaux se réunissent au milieu sur toute la longueur.

Le fémur postérieur avec toutes les carènes lisses.

Le lobe géniculaire interne et externe se terminant en pointe obtuse. Le tibia postérieur au bord interne (l'épine apicale y comprise) avec 9 épines, le bord externe avec 9 épines, pourvu d'une épine apicale.

Le tarse postérieur long, presque aussi long que la moitié du tibia postérieur.

Le 3^e article du tarse postérieur presque aussi long que les deux autres réunis.

♂. Plaque suranale triangulaire, l'apex pointu, avec un sillon longitudinal médian.

Cerque court, droit, ne dépassant pas le bout de la plaque suranale, acuminé.

Plaque sous-génitale recourbée, arrondie au sommet.

Ce genre vient se placer près de *Peitharchicus* Brunner, dont il diffère par les tibias postérieurs de forme non arrondie et de *Leptacris* Walk. par le nombre d'épines des tibias postérieurs, étant 9 chez *Hebridea* et 20-21 chez *Leptacris* Walk.

Hebridea rufo-tibialis nov. sp.

Génotype.—Couleur du corps brun-olive. Antennes rouge-brunâtres, les articles du milieu plus foncés.

L'élytre verdâtre. Le fémur postérieur vert-olive, les genoux rembrunis. Le tibia postérieur, ainsi que le tarse, d'un beau rouge. Les épines rouges, à l'apex noires.



FIG. 5.—*Hebridea rufo-tibialis* nov. gen. et spec. ♂.

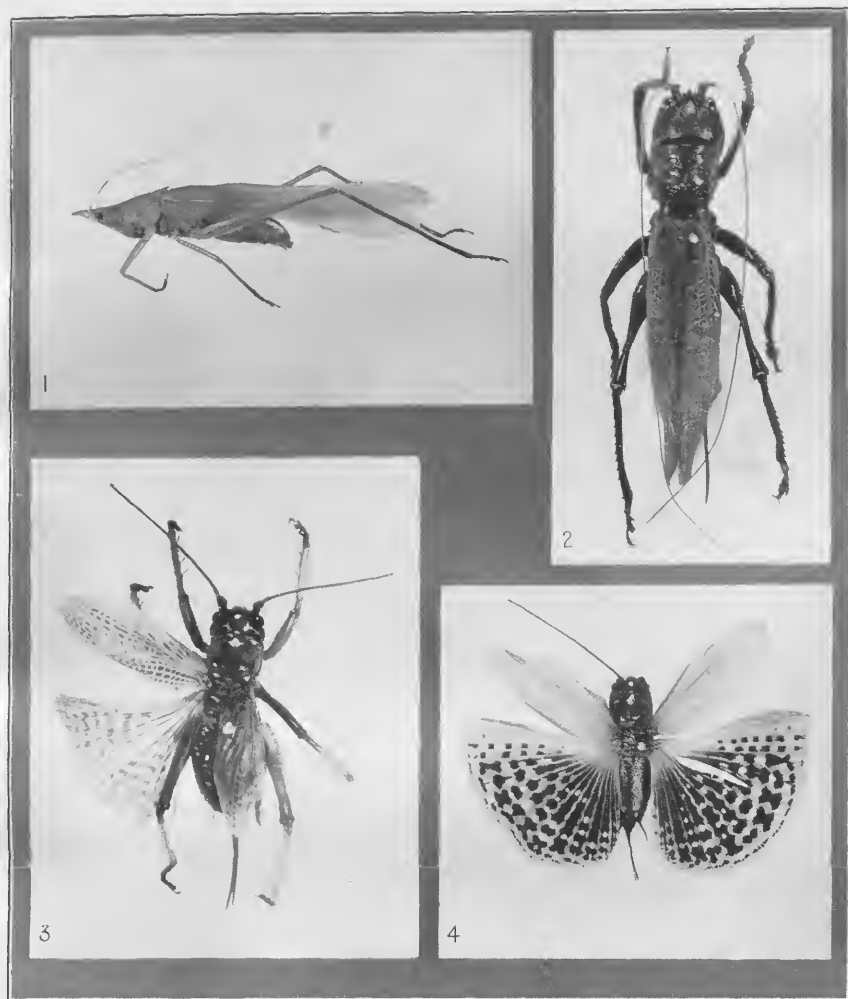
					♂.
Longueur du corps	.	.	.	.	20 mm.
„ de l'antenne	.	.	.	.	9 „
„ du pronotum	.	.	.	.	4 „
„ de l'élytre	.	.	.	.	6.5 „
„ du fémur postérieur	.	.	.	.	10 „
„ du tibia postérieur	.	.	.	.	9 „
„ du tarse postérieur	.	.	.	.	4 „

Localité : New Hebrides, Espir.-Santo Isl. (Hog Harbour, clearings), Jan. 4, 1923, 1 ♂, type. Text-fig. 5.

DESCRIPTION OF PLATE LI.

- FIG. 1. *Euconocephalus extensor* Walk.
 2. *Salomona magnifica* n. sp.
 3. *Gryllacris poultoni* n. sp.
 4. „ *punctipennis* Walk.

Photographs by C. Willemse.



Vaus & Crampton, Ltd.

NEW HEBRIDEAN ORTHOPTERA.

Apterygota from the New Hebrides.

By H. WOMERSLEY, F.E.S.

[Plates V. & VI.]

For the opportunity of examining and describing the following species of Apterygota I am greatly indebted to Dr. J. R. Baker of Oxford. The specimens comprised a small collection made by Dr. Baker while on a collecting expedition to the New Hebrides in 1927, which expedition

was partly financed by the Trustees of the Percy Sladen Fund.

The collection was somewhat small in the number of species as well as individuals. All the species are, however, new to science, and the single Thysanuran (a Lepismid) is of considerable interest, as it requires a new genus coming between the well-known genera *Ctenolepisma*, Escherich, and *Thermobia*, Clittenden. For the new genus I propose *Bakerella*, after Dr. Baker, and for the species *andersonæ* after the wife of the missionary who assisted Dr. Baker in collecting these insects.

All the other species belong to the Collembola and are all members of the genus *Lepidocyrtus*, Bourl., and its ally *Pseudosira*, Schött. Although these species are different from any yet described, they show a very definite relationship with the forms described from the Bismarck Archipelago by Schäffer, 1898.

The species and number of specimens are :—

THYSANURA.

Bakerella andersonæ, gen. et sp. n.

COLLEMBOLA.

Pseudosira flavescens, sp. n.

Lepidocyrtus pseudopictus, sp. n.

„ *medioides*, sp. n.

„ ? sp. indet.

THYSANURA.

Family Lepismidæ.

Genus BAKERELLA, nov.

Allied to the genus *Ctenolepisma*, Escherich, but differs in that the dorsal “setal combs” are not present on the thoracic tergites. It is further intermediate between *Ctenolepisma* and *Thermobia* in having only a single pair of dorsal posterior sublateral “setal combs” on abdominal tergites ii. to viii. with, in addition, a submedial posterior pair on tergite iv. The lateral combs on thoracic tergites number ten to twelve. Posterior lateral combs are present on abdominal tergites ii. to viii. The mandible just below the toothed apex is finely “figured” in a scale-like manner, but whether this character is of generic value remains to be seen.

Bakerella andersonæ, sp. n. (Pl. V. figs. 1-5.)

Colour when scaled uniformly brown, denuded of scales whitish yellow.

Body-length 7 mm., thorax 2 mm., not much wider than the basal abdominal segments (Pl. V. fig. 1).

Head between antennæ and between the antennæ and the eyes heavily fringed with strong feathered setæ, some of which are bifid at the tip.

Antennæ, unscaled except on two basal joints, about half the length of body. Max. palpi five-jointed, the joints respectively 3 : 6 : 8 : 7 : 6½, lacinia shorter than galea. Mandible with four strong but blunt teeth and with a well-developed molar area; below the teeth of the mandible the surface is finely "figured" in a scale-like manner (fig. 2). Labial palpi four-jointed (fig. 4), the terminal joint with six papillæ in a single row. Each papilla is on a short peduncle and is itself papillose. On the inner edge of the terminal joint are several erect sensory clubs (fig. 4).

Thoracic tergites with from ten to twelve lateral setal combs on each side, and these usually with only three to five setæ in each. Dorsal combs absent. Legs armed with strong spines and a few feathered setæ. On the inner side of the femora are three of the latter. Empodium about half the length of the lateral claws.

Abdominal tergites ii. to viii. with posterior lateral combs and a pair of posterior sublateral combs. Tergite iv. has a posterior submedial pair in addition. Tenth abdominal tergite as in *Ctenolepisma*. Styles present on segments viii. and ix., the latter twice the length of the former. Penis short, just reaching the tip of ninth subcoxæ. Medial process of cerci half the length of body, lateral processes a little shorter.

Described from two male specimens (one sacrificed for dissection) taken in the Missionary's linen cupboard, Hog Harbour, Santo, New Hebrides, April 5th, 1927.

Type. In the Hope Museum, Oxford.

COLLEMBOLA.

Suborder ARTHROPLEONA, Börner.

Family Entomobryidæ, v. Dalla Torre.

Subfamily ENTOMOBRYINÆ, Schöff., Börn.

Tribe ENTOMOBRYINI, Börn.

Genus PSEUDOSIRA, Schött.

Pseudosira flavescentis, sp. n. (Pl. VI. figs. 12-14.)

Colour (in alcohol) light yellow with a black dot between antennæ and a slight brownish tinge on head and on the sixth

abdominal segment. Antennæ yellow with a black tip on second and third segments, fourth segment brownish. Legs and furca yellowish.

Eyes eight on each side on a black patch.

Antennæ about three-quarters length of body, first two joints at least with scales. Relative lengths of joints 6:7:7:11, joints thickly clothed with unciliated hairs, 2 and 3 with two or three outstanding ciliated setæ, fourth joint unannulated and with apical sense-knob.

Legs with a strong clavate tibial tenent hair, joints with numerous hairs, most of which are finely ciliated, and a number of ciliated setæ. Claws similar on all feet. Unguis long and narrow with a strong outer basal tooth and two inner teeth nearer to each other than the distal one is to the apex. Unguiculus rather more than three-quarters the length of unguis, untoothed.

Furca almost two-thirds the length of body—manubrium : mucrodens : 4:7,—unannulated portion of dens one and a half times the length of mucro, dens scaled ventrally. Dens and manubrium with strong finely ciliated hairs. Mucro of medium size, only separated from dens ventrally, with only a blunt moderately curved apical tooth and without basal spine.

Abdominal segment iv. three and a half times the length of segment iii.

Clothing consists of numerous fine hairs and a number of strong finely ciliated setæ. On the head, on the mesonotum, and on segment vi. of the abdomen these setæ are clubbed and bent and with the cilia only at the end, while on the mesonotum they form a very distinct deflected collar.

Size 2 mm.

Locality. 3 specimens on rain-water in canoe, Elephant Island, Santo, New Hebrides, May 19, 1927; 2 specimens on rain-water in canoe, Gaua, Santo, New Hebrides, June 8, 1927.

This species is apparently closely related to *P. indra*, Imms, and *P. evansi*, Brown.

Type and co-types in the Hope Museum, Oxford.

Genus LEPIDOCYTUS, Bourl.

Lepidocytus pseudopictus, sp. n. (Pl. VI. figs. 6-9.)

Colour (in alcohol): head with bluish-black patches on sides leaving a clear whitish-yellow dorsal stripe, mesonotum which considerably overlaps head similarly dark at the sides

with a whitish dorsal longitudinal stripe, metanotum all dark, first abdominal segment all whitish yellow, second and third all dark, fourth light but flecked with a few dark scales for two-thirds of its length then becoming all dark, fifth all yellow, sixth with a few dark markings. Legs and furea yellowish becoming brownish on femora and manubrium. Antennal joints purplish brown at base becoming yellow at tip.

Scales typical of the genus.

Eyes eight on each side on a black patch.

Antennæ rather more than half the length of body, first two joints with scales, relative lengths of joints 7 : 10 : 9 : ?. First three segments (specimen damaged) thickly haired and with two or three strong ciliated setæ.

Legs with strong clavate hair, joints thickly covered with ciliated hairs, tibiæ with one or two strong outstanding setæ. Claws similar on all feet, unguis long and narrow with a strong outer basal tooth and three fine inner teeth, one almost at the tip, the others at equal distances apart, unguiculus lanceolate, three-quarters the length of unguis, and with a fine outer tooth about a quarter its length from base (fig. 9).

Furea long, reaching the second thoracic sternite, manubrium : muerodens : 7 : 9, unannulated portion twice the length of dens. Dens and manubrium with numerous finely ciliated hairs. Muero of moderate size, with a strong, slightly curvèd, apical tooth and an equally strong medial tooth with straight inner edge, and a basal spine. Muero distinctly separated from dens.

Abdominal segment iv. five times the length of segment iii.

Length of insect 2.5 mm.

Locality. A single specimen taken on table in tent at Hog Harbour, Santo, New Hebrides, March 30th, 1927.

Type. In the Hope Museum, Oxford.

This species is very closely allied to *L. pictus*, Schäffer, 1898, from the Bismarck Archipelago. In coloration it may be distinguished by the larger amount of colouring on the sides of the head and the completely dark metathorax, which in Schäffer's species is colourless. The fifth abdominal segment in *pseudopictus* is colourless in contrast to the dark segment in *pictus*. The claws are similar in both species, but the mueronal teeth in *pseudopictus* are decidedly recurved and very distinct from those of *pictus*.

Lepidocyttus medioides, sp. n. (Pl. VI. figs. 10-11.)

Colour (in alcohol) uniformly yellowish except for the

black eye-patch, a small black dot between the antennæ, and a very faint line joining this spot to the eye-patches. Antennæ (first two joints only) yellowish with a violet suffusion near the tips.

Eyes eight on each side.

Antennal joints 3 : 4 : ? : ? , covered with ciliated hairs.

Head about as long as mesonotum, which apparently only slightly overhangs.

Legs with a long fine clavate hair and covered with strong ciliated hairs, outstanding setæ few if any, claws similar on all feet. Unguis lanceolate with strong but fine outer basal tooth and three fine inner teeth. Unguiculus only moderately broad, about three-fourths the length of unguis, obliquely truncate distally with slight suspicion of a tooth at inner angle, otherwise unarmed.

Furca half the length of body excluding head, manubrium : mucrodens : 4 : 5, both manubrium and dens covered with scales and finely ciliated hairs to base of mucro, dorsally and ventrally the mucro is distinctly separated from dens. The mucro has a blunt curved apical tooth and a similar tooth one-third from apex and a stout basal spine. Dens annulated to base of mucro.

Abdominal segment iv. about three times the length of segment iii. A number of ciliated setæ at end of abdomen are slightly clubbed.

Length 1.3 mm.

Locality. Hog Harbour, Santo, New Hebrides, January 28, 1927. A single specimen from water lying in an opened coconut.

Type. In the Hope Museum, Oxford.

This solitary specimen was in poor condition, and consequently not altogether satisfactory for determination. In colour and details it comes very near to *L. medius*, Schäffer, from the Bismarck Archipelago, but differs apart from its rather larger size in having three strong inner teeth to the upper claw and a fine one at the inner angle of the lower claw. It also shows considerable relationship to *Lepidocyrtoides angulatus*, Schött., from North Queensland, but whether it belongs to the subgenus *Lepidocyrtoides* is indeterminable.

Lepidocyrtus sp. indet.

A single specimen in very poor condition, impossible to determine, taken in camp, Santo, New Hebrides, February 24, 1927.

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EXPLANATION OF THE PLATES.

PLATE V.

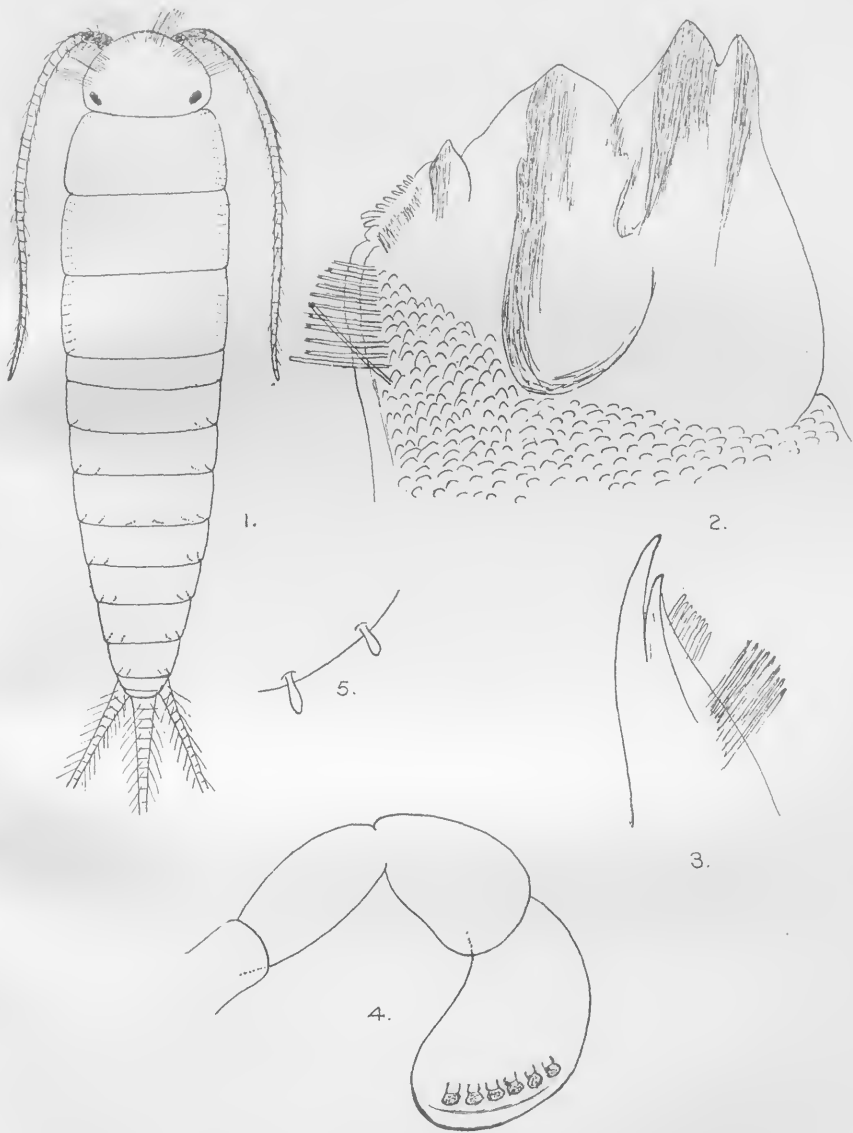
Thysanura.

- Fig. 1. *Bakerella andersonæ*, gen. et sp. n.
- Fig. 2. Ditto. Tip of mandible.
- Fig. 3. Ditto. Tip of lacinia.
- Fig. 4. Ditto. Labial palp.
- Fig. 5. Ditto. Edge of labial palp (terminal joint) showing sensillæ.

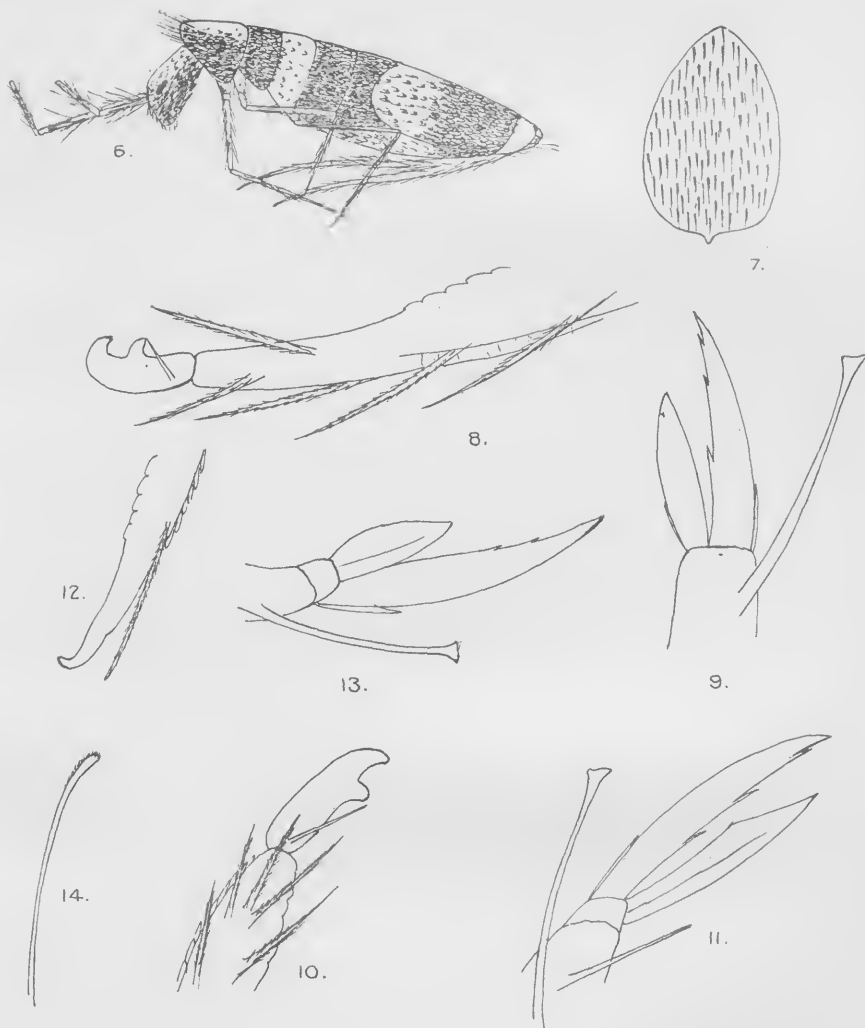
PLATE VI.

Collembola.

- Fig. 6. *Lepidocyrtus pseudopictus*, sp. n.
- Fig. 7. Ditto. Scale.
- Fig. 8. Ditto. Mucro and tip of dens.
- Fig. 9. Ditto. Foot.
- Fig. 10. *Lepidocyrtus medioides*, sp. n. Mucro and tip of dens.
- Fig. 11. Ditto. Foot.
- Fig. 12. *Pseudosira flavescens*, sp. n. Mucro and tip of dens.
- Fig. 13. Ditto. Foot.
- Fig. 14. Ditto. Thoracic seta.



THYSANURA FROM THE NEW HEBRIDES.



COLLEMBOLA FROM THE NEW HEBRIDES.

ON A NEW SPECIES OF *TRICHTOTHIRIPS* FROM AUSTRALIA.

BY RICHARD S. BAGNALL AND REGINALD KELLY.

Reprinted from 'The Entomologist's Monthly Magazine,' Vol. lxv.

This new and distinct species is unfortunately based on a single casual example that had flown on to a newspaper. It comes into the *ulmi-corticis-britteni* group, and is distinct from all in its coloration; not only has it light lemon yellow tibia and an orange yellow tube, but the antennae are peculiar in that the second joint is the lightest. Antennal joints 7 and 8 are *not* closely united, and joint 8 is very slender and long, being about subequal in length with 7.

We find particular pleasure in naming the species after our friend and mentor, Professor E. B. Poulton, F.R.S.

Trichothrips poultoni sp. n.

♀. Length about 2.0 mm.

General colour brown, head and pronotum more darkly and uniformly shaded with dark grey-brown than the pterothorax and abdomen; tube orange to reddish-yellow in the basal half, shading to a nondescript pale grey-brown distally. Femora brown, paler distally and basally, and all tibiae and tarsi (except for blackish-brown distal spot) pale lemon-yellow. Wings fumate. Antennae with joint 1 practically concolorous with head, 2 yellowish lightly tinged with grey to grey-brown basally, 3 yellowish basally shading gradually to dark brown distally, 4 to 8 dark blackish-brown, 4 and apparently 5 somewhat, though very slightly, lighter basally. Bristles pale, terminal hairs of tube

fumate. The wings, which reach to the tube, are folded down the back, but the ends are displayed and the fore-wing is shown to have at least a dozen duplicated cilia. The general form is as in the group *ulmi-corticis-britteni*, but the antennal joint 8 is not only well separated from 7 but subequal in length. Fore-tarsal tooth sharp.

The following are the measurements :—

Length (and breadth behind eyes) of head and the length (and greatest breadth) of pronotum, 250 (250) and 200 (400) μ respectively; breadth of pterothorax 512, and of abdominal segment 4 about 600 μ ; length (and breadth at base and at apex) of tube 250 (108 : 50) μ . Length (and breadth) of the femora and tibiae as follows : I, 244 (112), 182 (50); II, 200 (68), 188 (48); III, 280 (82), 270 (50) μ ; whilst the lengths (and breadths) of the antennal joints are approximately 50 (50), 70 (40), 88 (45), 91 (42), 82 (38), 77 (36), 65 (28), 65 (19.5) μ .

Length of bristles—postoculars 136 μ , fore-coxal 105 μ , pronotal antero-angular, mid-lateral and postero-angular 80, 150 and 165 μ respectively, abdominal segments 7, 8 and 9 approximately 250, 225 and 220-275 μ respectively. Length of terminal hairs c.188 μ .

AUSTRALIA, Hawthorn, Victoria, 1 ♀ on newspaper whilst reading (R. Kelly n.s.45) 9, xii, 1927.

Three other species of Australian *Trichothrips* are known, all of which have the antennal joints 7 and 8 more or less broadly united. Of these, *T. erinaceus* Karny (1920) is a dark species with pale intermediate antennal joints; *T. melanurus* Bagnall (1919) is a lighter species, not unlike the European *pedicularis* Hal., with pale tibiae and a very dark tube; whilst *T. connexus* Hood (1919) is also a light species, having the third antennal joint, all tibiae and tube yellow and wings light brown. In fact, *T. poultoni* in its type of coloration agrees closely with *T. connexus*, but that species is smaller and has dark antenna with the third joint abruptly yellow, whilst the apical joints are connate, and there are numerous points of difference in form and measurements.

March 9th, 1929.

Catalogue of the Arachnological Library

bequeathed to the

University of Oxford

by the Rev.

Octavius Pickard-Cambridge, M.A., F.R.S.

Compiled by his Son

Arthur W. Pickard-Cambridge, M.A., F.E.S.

Fellow of Balliol College

1926



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INTRODUCTORY NOTE.

THE books enumerated in this Catalogue came into the possession of the University of Oxford in 1917, and are in the Hope Department of the University Museum. It was a condition of the bequest that a Catalogue of them should be published, so that students of the Arachnida might be better able to have recourse to them. This condition is now fulfilled. It will be seen that the Library is very complete up to about 1910, and any additions which will help to keep it up to date will be gratefully welcomed by the Hope Professor of Zoology. The fact that the testator's collection of Arachnida is in a gallery adjoining the room in which the Library is placed and is accessible to students should greatly enhance the usefulness of both. A copy of this Catalogue, with shelf-numbers inserted, will be placed in the Library.

A.W.P.-C.

May 25, 1926.

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